King County
Site Management Plan (SiMPla)

May 2012

Department of Natural Resources and Parks
Water and Land Resources Division
Stormwater Services Section
King Street Center, KSC-NR-0600
201 South Jackson Street, Suite 600
Seattle, WA 98104
206-296-6519 TTY Relay: 711
www.kingcounty.gov/stormwater

Alternate Formats Available
206-296-7380 TTY Relay: 711

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King County Integrated Pest Management Document

King County
Site Management Plan (SiMPla)
Introduction

Overview: The Site Management Plan (SiMPla) was developed to help King County departments identify activities that can cause pollution to enter stormwater runoff, and to take actions to prevent such pollution. These actions will enable King County agencies to achieve compliance with the Operations and Maintenance Section of the Phase I NPDES Municipal Stormwater Permit issued in 2007 (Permit section S5.C.9.), as well as additions in the draft 2013 Permit. The goal of the SiMPla is to help County supervisors and staff personnel (and subcontractors) conduct work activities so that stormwater pollution is prevented or minimized. The SiMPla best management practices (BMPs) have been gathered from a number of King County documents and manuals. The intent of the SiMPla is to gather these BMPs into one document for ease of use for county employees.

The SiMPla sets recommended minimum standards to be followed any time King County personnel are conducting the specific work tasks included in this document at properties or locations subject to the Phase I NPDES Municipal Stormwater Permit. King County agencies have the option of implementing approved alternative policies and procedures, provided those policies are at least as protective of stormwater as those outlined in the SiMPla.

The SiMPla is similar, but not identical, to a stormwater pollution prevention plan (SWPPP). A SWPPP is a site-specific plan for workers at a given location to prevent or minimize stormwater pollution. The SiMPla is also a plan to minimize and prevent stormwater pollution but it differs from a SWPPP in that it is intended to apply to many sites and work locations, including County-owned or -maintained property that is subject to the Phase I NPDES Municipal Stormwater permit. The SiMPla is for use by personnel across all King County departments and divisions. County divisions include:

- Solid Waste
- Wastewater
- Transit
- Airport
- Parks
- Facilities Management
- Roads
- Water and Land Resources

The SiMPla consists of BMPs that support standards for operations and maintenance activities outlined in Special Conditions S5.C.9.b.vi and vii of the 2007 Permit.

Table of Contents: The SiMPla has a table of contents to help find specific BMPs related to work activities. The Table of Contents is organized into six sections:

1. Operations and Maintenance of Road rights-of-way (ROWs) – Describes BMPs for work activities conducted by King County Roads Maintenance Section personnel in County Roads Right of Ways (ROWs), not including activities for maintaining and cleaning the stormwater conveyance system (a separate section). **Important Note**: County staff personnel in divisions other than Roads conduct the same or similar work activities on properties outside the County ROW. Such staff should implement the BMPs described in this section.
2. Building Exterior and Grounds Operations and Maintenance – Describes BMPs for operations and maintenance of building exteriors and grounds of County properties, including vehicle cleaning and maintenance activities.
3. Maintenance and Operations of the Municipal Separate Storm Sewer System (MS4) – Describes BMPs for cleaning and maintaining the County's stormwater conveyance system (municipal separate storm sewer system or "MS4").
4. Erosion Control – Stormwater BMPs for a variety of site-disturbing work activities.
5. Water Conservation – BMPs to reduce water usage, thereby reducing stormwater flow, for a variety of work activities.
6. Integrated Pest Management (IPM) – BMPs to minimize or prevent application of pesticides, fertilizers, and herbicides.

Source Materials: Information from the following sources was used to create the SiMPla:

- Draft Maintenance Performance Standards (King County Department of Transportation, April 2008)
- Stormwater Pollution Prevention Manual (King County, Department of Natural Resources and Parks, January 2009)
- Regional Road Maintenance Guidelines (Regional Road Maintenance Technical Working Group-Western Washington/Puget Sound, 2003)
- Stormwater Management Manual for Western Washington (Washington State Department of Ecology, 2005)
- Draft Stormwater Management Manual for Western Washington ((Washington State Department of Ecology, 2011)
- King County Industrial Waste program information (obtained online in 2011)
- King County Roads Decant program information (obtained online in 2011)
- "Report on Integrated Roadside Vegetation Management" (IPM Associates, Eugene, OR, February 1994)

- Tri-County IPM Policy, Guidelines and Final Report (Local Hazardous Waste Management Program, 1999)
- Integrated Pest Management (IPM) (Department of Executive Services, 2012)

BMPs FOR OPERATIONS AND MAINTENANCE OF ROAD ROW

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Introduction
BMPs for Operations and Maintenance in Road ROW

The stormwater pollution-preventing BMPs in this section are to be implemented for work in County Roads Right-of-Way (ROW) areas, as well as any other County-owned, -maintained, or -operated properties, when any of the following work activities are conducted:

- Restoring damaged landscaping
- Mowing
- Pavement striping
- Using pesticides, herbicides, fertilizers
- Repairing roads
- Resurfacing roads
- Spreading sand and ice-melting compounds onto roads before/during snow/ice events
- Removing sand from roads after snow/ice events
- Street sweeping
- Installing utilities
- Work where a Hydraulic Project Approval permit is required

The BMPs in this section describe the necessity of performing the work tasks, as well as how to do the work so that stormwater flowing over and off County work areas is kept as clean and unpolluted as possible. By fully implementing the stormwater pollution-preventing BMPs described in this section this goal will be achieved.

If a staff worker or crew is unclear on how to perform either a work task or how to implement the stormwater pollution preventing BMPs described here, staff needs to check with supervisors. If a supervisor is not clear on the best way to implement any BMP, he/she should contact King County Water and Land Resources Division (WLRD) Stormwater Services Section for clarification.

RESTORING DAMAGED LANDSCAPE

Potential Pollutant Source:

Sediment from landscaping and repair activities could enter the stormwater system and/or nearby natural waterways. Erosion control measures are to be implemented whenever there's a chance this could happen.

Purpose:

County properties and Road ROW areas require restoration of landscape areas damaged by maintenance or other activities, or by road failures.

Description of BMP:

Follow necessary safety and personal protection guidelines when operating landscaping equipment and using hand tools.

Place traffic safety devices as required.

Implement erosion control measures as appropriate; in all cases minimize soil disturbance and prevent sediment transport offsite.

Conduct necessary activities, including planting, filling in ruts, replacing rockery rocks, etc.

Sweep sediment up with hand brooms and/or with a vacuum street sweeping truck; do not hose sediment into the stormwater system.

Empty sweeper truck at dumpsite or stockpile debris and haul to designated dumping/storage area at the end of the project.

When using sweeper truck, accurately report lane miles of roadway swept.

Remove traffic control devices.

Also Refer to SiMPla Sections:	*Municipal Separate Storm Sewer System (MS4)* section, Ditch Maintenance BMP; *Erosion Control* section.
Phase I Permit Requirements Fulfilled by BMPs:	S5.C.9.b.vi (8), Maintaining roadside areas, including vegetation management. S5.C.9.b.vii (3), Landscape maintenance and vegetation disposal (BMP partially fulfills).
Search Words:	Street sweeping; landscape restoration; landscape maintenance.
References and Resources for Additional Information:	IPM Associates, Inc, Eugene, Oregon, "*Report on Integrated Roadside Vegetation Management*", prepared for King County, Washington, Department of Public Works, Roads and Engineering Division, Renton, WA, February 1994. King County Department of Natural Resources, *King County Stormwater Pollution Prevention Manual*, January 2009, Activity Sheet A-26, "Landscaping Activities and Vegetation Management". King County Department of Transportation, *Draft Maintenance Performance Standards*, April 2008, the following: Performance Standard 260, "Street Sweeping"; Performance Standard 167, "Landscape Restoration"; and Performance Standard 269, "Landscape Maintenance". Regional Road Maintenance Technical Working Group (Western Washington/Puget Sound), *Regional Road Maintenance ESA Guidelines*, 2003, Part 1, Regional Program Elements, Maintenance Category #15, Vegetation. http://www.kingcounty.gov/transportation/kcdot/Roads/Environment/RegionalRoadMaintenanceESAGuidelines.aspx Washington State Department of Ecology, *Stormwater Management Manual for Western Washington*, Vol. IV, Chapter 2, 2-23, "BMPs for Landscaping and Lawn/Vegetation Management".

MOWING VEGETATED AREAS (INCLUDES ROADSIDE ROW AND COUNTY PROPERTIES AND FACILITIES)

Potential Pollutant Source: Remove cut grass and other vegetation when directed to do so by supervisor; if not clear, check in with him/her. Cut vegetation, while not a "pollutant," can lead to drainage and higher-than-normal nutrients.

Purpose of Mowing: Mowing of vegetated areas within County road ROWs is usually done to preserve sight distance. In stormwater drainage ponds it maintains drainage. On County properties it improves appearance. Mowing also can control the growth and reproduction of grasses; undesirable woody plants; annual, biennial and perennial plants; and noxious weeds. The frequency and height of mowing depends on the type of vegetation and site management objectives. For example, roadside shoulders are frequently mowed to different specifications than sideslopes.

Description of BMPs: Equipment selection is based on width, steepness and vegetation type. Broad, gently sloped grassy shoulders can be mowed with rotary cutting head mowers. Narrower shoulders and steep slopes, or areas with brush, require boom mounted flail mowers.

Follow necessary safety and personal protection guidelines when operating mowing and trimming equipment. Mowers, especially rotary head cutters, can throw debris at high speed; they require careful handling to protect workers and the public.

Place traffic safety devices as required.

Mow designated area with a hand mower, a slope mower (boom mounted flail) or a shoulder mower (rotary cutting head), as appropriate.

For rotary head cutters, determine and set relevant the mower height for the area to be mowed.

Hand trim utility areas or other structures with a string trimmer.

If more than one worker at a time, second and third workers are to keep safe distances from mower at all times.

Collect grass clippings as needed (especially in drainage ponds) or arrange for this to be done.

Clean walkways with a blower, as needed.

Remove traffic control devices.

Also Refer to SiMPla BMP: *Municipal Separate Storm Sewer System (MS4) section:* Ditch Maintenance BMP.

Phase I Permit Requirements Fulfilled by BMP: S5.C.9.b.vi (8), Maintaining roadside areas, including vegetation management.
S5.C.9.b.vii (3), Landscape maintenance and vegetation disposal (BMP partially fulfills).

Search Words: Ditch maintenance; mechanical vegetation control; manual vegetation control; backslope maintenance; shoulder mowing; hand mowing; landscape maintenance; vegetation management; Integrated Vegetation Management.

References and Resources for Additional Information:

IPM Associates, Inc, Eugene, Oregon, "*Report on Integrated Roadside Vegetation Management*", prepared for King County, Washington, Department of Public Works, Roads and Engineering Division, Renton, WA, February 1994.

King County Department of Natural Resources, *King County Stormwater Pollution Prevention Manual*, January 2009, Activity Sheet A-26, "Landscaping Activities and Vegetation Management".

King County Department of Transportation, *Draft Maintenance Performance Standards*, April 2008, the following:
Performance Standard 262, "Slope/Shoulder Mowing"
Performance Standard 269, "Landscape Maintenance"
Performance Standard 292, "Hand Mowing"

Regional Road Maintenance Technical Working Group (Western Washington/Puget Sound), *Regional Road Maintenance ESA Guidelines*, 2003, Part 1, Regional Program Elements, Maintenance Category #15, Vegetation.
http://www.kingcounty.gov/transportation/kcdot/Roads/Environment/RegionalRoadMaintenanceESAGuidelines.aspx

Washington State Department of Ecology, *Stormwater Management Manual for Western Washington*, Vol. IV, Chapter 2, 2-23, "BMPs for Landscaping and Lawn/Vegetation Management".

PAVEMENT STRIPING & MARKING

Potential Pollutant Source: Paint and other materials could be inadvertently spilled or sprayed into the stormwater conveyance system.

Purpose: Road markings are of crucial importance to provide guidance to drivers (lane boundaries, etc.).

Description of BMPs: Follow state and federal guidelines for handling paint and other traffic marking materials.

Stripe roadways in dry weather; refer to manufacturer recommendations for optimal application conditions.

Store and maintain appropriate spill cleanup materials, and ensure employees are familiar with the spill control plan and proper spill cleanup procedures.

Train employees in careful and appropriate application of paints and other marking materials to reduce misuse and overspray.

Phase I Permit Requirements Fulfilled by BMP: S5.C.9.b.vi (10), Pavement striping maintenance.

Search Words: Pavement marking; pavement striping.

References and Resources for Additional Information:

King County Department of Natural Resources, *King County Stormwater Pollution Prevention Manual*, January 2009, Activity Sheet A-22, "Painting, Finishing, and Coating of Vehicles, Products and Equipment".

Regional Road Maintenance Technical Working Group (Western Washington/Puget Sound), *Regional Road Maintenance ESA Guidelines*, 2003, Part1, Regional Program Elements, Category 1, "Roadway Surface", http://www.kingcounty.gov/transportation/kcdot/Roads/Environment/RegionalRoadMaintenanceESAGuidelines.aspx

PESTICIDE, FERTILIZER AND HERBICIDE CONTROL

Image of sprayed weeds

Potential Pollutant Source:

Stormwater runoff from areas that have been subject to uncontrolled or inappropriate chemical application may be contaminated with pesticides, nutrients from fertilizers and toxic organic compounds or metals.

Purpose of Pesticide, Herbicide and Fertilizer Application:

For pest control, the preferred strategies use a defined "Integrated Pest Management" (IPM), which consists of site, target, and context-specific plans for control using mechanical, biological and chemical treatments. See the IPM guidance document included in this manual for IPM background and techniques.

Roadside spraying is conducted for infrastructure maintenance, and roadside safety concerns when economically necessary. It is also conducted in response to citizen requests and for compliance with directives from the King County Noxious Weed Control Board.

Description of BMPs:

All personnel applying herbicides to the landscape are either Washington State Department of Agriculture certified pesticide applicators or directly supervised in the field by certified applicators.

Follow manufacturer's recommendations and label directions for all pesticide treatments.

Compliance with State laws and record keeping regulations is required. Application records shall be made available to Seattle-King County Public Health Department upon request.

Pesticides applied within regulated buffers of surface waters will be applied per requirements of the Washington State Department of Ecology NPDES Permit for Aquatic Noxious Weed control, and the Tri County IPM guidelines.

Follow necessary/required safety and personal protection guidelines when mixing and/or handling chemicals and compounds.

Mix pesticides in a manner where unintended spills will not contaminate soil or be washed into the stormwater system or surface waters.

Rinseate from cleaning equipment or triple-rinsing pesticide containers should be recycled for use as product.

Application of herbicides may occur at any time of the year allowed by the product label and the following guidelines:

- "Vegetation-free zone" treatments will generally be accomplished by the use of pre- and post-emergent non-selective herbicides applied in spring and summer months as weather conditions allow. The vegetation-free zone begins at the paved road edge, and extends to the native soil/dirt fill or edge of shoulder. This zone includes guardrails, signs and other road hardware.
- "Operational zone" and "Transition zone" vegetation management generally involves the use of selective herbicides. The operational zone begins at the edge of shoulder or fill edge, and extends away from the roadway to include ditches and other drainage features. The transition zone includes the backslope and edge of the ROW outside the drainage area.
- Applications in operational and transitional zones may be summer foliage, or dormant stem, stump or modified basal treatments when allowed by the label.

Apply fertilizer in accordance to known requirements of the area soil and vegetation needs for successful establishment of planting.

Slow release fertilizers are encouraged and will be used when appropriate. Fertilizers may be applied with mulch, or worked in to the soil based on site and project conditions.

Also Refer to SiMPla sections: *Integrated Pest Management;* and *Water Conservation*.

Phase I Permit Requirements Fulfilled by BMP: S5.C.9.b.vi (8), Maintaining roadside areas, including vegetation management.
S5.C.9.b.vii (3), Landscape maintenance and vegetation disposal (BMP partially fulfills).

Search Words: Noxious weed control, guardrail spraying, roadside spraying, shoulder spraying, landscape maintenance; vegetation management; Integrated Vegetation Management.

References and Resources for Additional Information:

IPM Associates, Inc, Eugene, Oregon, "*Report on Integrated Roadside Vegetation Management*", prepared for King County, Washington, Department of Public Works, Roads and Engineering Division, Renton, WA, February 1994.

King County Department of Natural Resources, *King County Stormwater Pollution Prevention Manual*, January 2009, Activity Sheet A-26, "Landscaping Activities and Vegetation Management".

King County Department of Transportation, *Draft Maintenance Performance Standards*, April 2008, the following:
Performance Standard 287, "Shoulder Spraying"
Performance Standard 293, "Roadside Spraying",
Performance Standard 294, "Guardrail Spraying",
Performance Standard 295, "Noxious Weed Control"

Regional Road Maintenance Technical Working Group (Western Washington/Puget Sound), *Regional Road Maintenance ESA Guidelines*, 2003, Part 1, Regional Program Elements, Maintenance Category #15, Vegetation.
http://www.kingcounty.gov/transportation/kcdot/Roads/Environment/RegionalRoadMaintenanceESAGuidelines.aspx

Washington State Department of Ecology, *Stormwater Management Manual for Western Washington*, Vol. IV, Chapter 2, 2-23, "BMPs for Landscaping and Lawn/Vegetation Management".

Tri-County IPM Policy, Guidelines and Final Report, 1999,
http://www.lhwmp.org/home/ChemToxPesticides/ipm-guidlines.aspx .

Integrated Pest Management (IPM), Department of Executive Services, Finance and Business Operations Division, Procurement and Contract Services Section, Environmental Purchasing Program, 1/9/2012, available at .
www.kingcounty.gov/operations/.../~/.../**EP_Products_IPM**.ashx

PAVEMENT REPAIR & RESURFACING

Potential Pollutant Source:

Turbid water or sediment can enter waterways from exposed soils; employ measures, as needed, for: filter/perimeter protection; reducing water velocity/erosive forces; and/or soil erosion control measures. Materials related to asphalt work/vehicle usage can spill; adequate spill cleanup materials must be onsite for prompt cleanup.

Purpose:

Pavement repairs are done to keep King County roads, parking lots and driveways safely drivable and to prevent further deterioration. Repairs include: pothole patching and square cut patching (removal and patching of spot failures of asphalt pavement surrounded by good condition pavement); resurfacing asphalt bridge decks that show asphalt deterioration; and skin patching, filling settlements, bridge approaches and catch basins.

Description of BMPs:

Place signs and safety devices as required.

Implement erosion control as appropriate; in all cases minimize soil disturbance and prevent sediment transport from the work area.

Clean and prepare surface; for spot failures, square cut the area to be patched and/or remove loose material. For pothole patching, remove loose material.

If needed, tack vertical surfaces with asphalt emulsion.

Install petromat where needed.

Apply tack coat.

Place mix, roll and compact.

For square cut patches, fog seal with asphalt emulsion.

Clean area, remove traffic control devices.

Also Refer to SiMPla Section:

Erosion Control.

Phase I Permit Requirements Fulfilled by BMP: S5.C.9.b.vi (5), Road repair and resurfacing, including pavement grinding.

Search Words: Road repair; road resurfacing; asphalt; pavement repair.

References and Resources for Additional Information:

King County Department of Natural Resources, *King County Stormwater Pollution Prevention Manual*, January 2009, Activity Sheet, "".

King County Department of Transportation, *Draft Maintenance Performance Standards*, April 2008, the following:
Performance Standards 144 and 230, "Square Cut Patching";
Performance Standard 231, "Pothole Patching";
Performance Standard 443, "Skin Surface Patching";
Performance Standard 418, "Bridge Deck Resurface";

Regional Road Maintenance Technical Working Group (Western Washington/Puget Sound), *Regional Road Maintenance ESA Guidelines*, 2003, Part1, Regional Program Elements, Category 1, "Roadway Surface",
http://www.kingcounty.gov/transportation/kcdot/Roads/Environment/RegionalRoadMaintenanceESAGuidelines.aspx

SPREADING SAND AND ICE MELTING COMPOUNDS

Potential Pollutant Source: Sediment from sand, and excess salt, can be transported by stormwater runoff into sensitive areas.

Purpose: Sand is spread on roads, and salt on bridges, to control snow and ice.

Description of BMP: Apply sand or salt to specified areas, ensuring that excess amounts are not used.

Select materials to maximize effectiveness with minimal application of materials.

Calibrate equipment to ensure appropriate application rates.

Phase I Permit Requirements Fulfilled by BMP: S5.C.9.b.vi (5), Snow and Ice Control

Search Words: Snow and ice control; spreading sand; spreading salt.

References and Resources for Additional Information:

King County Department of Transportation, *Draft Maintenance Performance Standards*, April 2008, the following:
Performance Standard 280, "Snow and Ice-Spreading Sand/Salt".

Regional Road Maintenance Technical Working Group (Western Washington/Puget Sound), *Regional Road Maintenance ESA Guidelines*, 2003, Part1, Regional Program Elements, Category 10, "Snow and Ice Control",
http://www.kingcounty.gov/transportation/kcdot/Roads/Environment/RegionalRoadMaintenanceESAGuidelines.aspx

REMOVING SAND AND EXCESS ICE MELTING COMPOUNDS

Potential Pollutant Source: Sand and excess ice melting compounds can enter waterways if not removed after ice/snow events.

Purpose: Sand is removed from King County roads and other paved areas to minimize exposure of stormwater to sediments, and materials that may be transported by sediments, including oils and grease. Excess ice melting compounds also are removed, to minimize environmental impacts.

Description of BMP: A sweeper is a vehicle with brushes and/or a vacuum system and a water spray system used on roadways and paved areas to remove debris and soil particles; in this case, snow sand. Sweeping provides safe driving surfaces for the public, minimizes contamination of stormwater by sediment, and reduces airborne dust. Snow sand that is recovered by King County Roads Maintenance is taken to Roads Maintenance facilities for proper management, including storage, disposal and/or reuse, as appropriate.

Also Refer to SiMPla BMPs and Sections: *Construction & Maintenance of Roads* section: Street Sweeping; *Building & Grounds, County-owned* section: Sidewalk, Driveway, Vehicle Storage Area and Parking Lots; and *Erosion Control* section.

Phase I Permit Requirements Fulfilled by BMP: S5.C.9.b.vi (4), Street cleaning.
S5.C.9.b.vi (5), Snow and Ice Control;
S5.C.9.e .vi , 2013 Draft Permit, Snow and Ice Control and Disposal..

Search Words: Street cleaning; snow sand removal; snow sand management; snow sand disposal.

References and Resources for Additional Information:

King County Department of Transportation, *Draft Maintenance Performance Standards*, April 2008, the following:
Performance Standards 260, "Street Sweeping".

Regional Road Maintenance Technical Working Group (Western Washington/Puget Sound), *Regional Road Maintenance ESA Guidelines*, 2003, Part 1, Regional Program Elements, Category 10, "Snow and Ice Control",
http://www.kingcounty.gov/transportation/kcdot/Roads/Environment/RegionalRoadMaintenanceESAGuidelines.aspx

VACUUM STREET SWEEPING TRUCK

Potential Pollutant Source:

Sediment from landscape activities can enter the stormwater system and/or nearby natural waterways. **Trash**, **litter**, **leaks from vehicles**, **spills** and many kinds of **particulate matter** including **metals** typically accumulate on paved surfaces. These pollutants can be transported to the stormwater conveyance system when the surfaces are not cleaned regularly and if the material is not properly disposed of. Note: Hosing the pavement, parking or storage areas will add pollutants to the stormwater and is *not* a BMP.

Purpose:

Sweeping is done by hand or mechanical means. A sweeper is a vehicle with brushes and/or a vacuum system and a water spray system used on roadways and paved areas to remove debris and soil particles. Sweeping of County roadways and other paved properties, including parking lots, owned or maintained by the County provides safe driving surfaces for the public, minimizes contamination of stormwater by sediment, and reduces airborne dust. Also, regular dry sweeping of the paved areas prevents exposure of stormwater to pollutants and minimizes the addition of debris to stormwater.

Description of BMPs:

Paved areas, including roads, should be swept when they begin to show accumulation of sediment and other material, and after snow and ice control operations (where sand has been used).

For facilities, facility managers determine the schedules for pavement cleanup and sweeping. It is done as necessary to remove all loose trash, sediment, oil, solvents, plastics, and other significant materials.

DO NOT HOSE DOWN. Hoses and water are *not* used to clean the pavement, parking or storage areas. Additional cleanup and sweeping is performed before the beginning of the fall rainy season.

Use brooms in sensitive areas.

Schedule snow sand removal as part of snow and ice emergency response.

Follow necessary safety and personal protection guidelines when operating street sweeper.

Place traffic safety devices as required.

Sweep paved surfaces clean with necessary number of passes.

Empty sweeper truck at dumpsite or stockpile debris and haul to designated dumping/storage area at the end of the project.

Remove traffic control devices.

Also Refer to SiMPla BMPs and Section:

Construction & Maintenance of Roads section: Snow and Ice Control--Sand Removal. *Buildings & Grounds Exterior Cleaning & Maintenance* section: Sidewalk, Driveways, Vehicle Storage Areas and Parking Lots Cleaning; and *Erosion Control*.

Phase I Permit Requirements Fulfilled by BMP:

S5.C.9.b.vi (4), Street cleaning.
S5.C.9.b.vii (4), Trash management.

Search Words:

Street sweeping; snow sand removal; trash management; landscape maintenance; landscape restoration.

References and Resources for Additional Information:

King County Department of Natural Resources, *King County Stormwater Pollution Prevention Manual*, January 2009, Activity Sheet A-26, "Landscaping Activities and Vegetation Management."

King County Department of Transportation, *Draft Maintenance Performance Standards*, April 2008, the following:
Performance Standard 260, "Street Sweeping"; and
Performance Standard 269, "Landscape Maintenance."

Regional Road Maintenance Technical Working Group (Western Washington/Puget Sound), *Regional Road Maintenance ESA Guidelines*, 2003, Part 2, Best Management Practices, "Sweeping",
http://www.kingcounty.gov/transportation/kcdot/Roads/Environment/RegionalRoadMaintenanceESAGuidelines.aspx
Washington State Department of Ecology, *Stormwater Management Manual for Western Washington*, Vol. IV, Chapter 2, 2-23, "BMPs for Landscaping and Lawn/Vegetation Management".

UTILITY INSTALLATION BMPs

For Utility Installation BMPs refer to Erosion Control Section S5.C.9.b.vi (7) Utility installation

Phase I Requirement Fulfilled by BMP

WORK REQUIRING PROJECT-SPECIFIC HYDRAULIC PROJECT APPROVALS

Potential Pollutant Source: Bucket ditching, building/repairing concrete structures, bridge maintenance, stream crossings and other activities performed in or near waterways can create erosion that causes turbid water or sediment to enter these waterways. Some projects may need project-specific Hydraulic Project Approvals (HPAs) from the Washington State Department of Fish and Wildlife (WDFW) prior to doing work; check with supervisors. Specific work tasks in or near waterways may need to conform to WDFW HPA regulations.

Purpose: Obtaining HPAs where required by the State helps to ensure that work tasks are done in accordance with WDFW requirements.

Description of BMP: Consult supervisor to ensure that a HPA, if required, has been obtained for work tasks/projects that can impact natural waterways.

Also Refer to SiMPla Section: *Erosion Control*.

Phase I Permit Requirements Fulfilled by BMP: S5.C.9.b.vi (3) Ditch maintenance;
S5.C.9.b.vi (5), Road repair, and resurfacing, including pavement grinding.
S5.C.9.b.vi (7) Utility installation.

Search Words: Hydraulic Project Approval; HPA.

References and Resources for Additional Information: Regional Road Maintenance Technical Working Group (Western Washington/Puget Sound), *Regional Road Maintenance ESA Guidelines*, 2003, Part1, Regional Program Elements, Maintenance Category #5, "Watercourses and Streams"; Maintenance Category #6, "Stream Crossings"; at http://www.kingcounty.gov/transportation/kcdot/Roads/Environment/RegionalRoadMaintenanceESAGuidelines.aspx

BMPS FOR BUILDING EXTERIOR AND GROUNDS OPERATIONS AND MAINTENANCE

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Introduction
BMPs for Building Exterior and Grounds Operations and Maintenance

The stormwater pollution-prevention BMPs in this section should be implemented when the following work tasks are performed on all County owned, maintained or operated properties:

- Trash and pet waste management
- Pressure washing buildings and exterior surfaces
- Painting and repairing building exteriors
- Cleaning paved areas such as driveways and sidewalks
- Handling and storing solid waste, including trash and recyclables
- Managing all stockpiles, including sand, gravel and other materials
- Handling and storing all liquid materials
- Parking, storing and maintaining County vehicles
- Washing County vehicles
- Controlling spills

The BMPs in this section describe the necessity of performing the work tasks, as well as how to do the work so that stormwater flowing over and off County work areas is kept as clean and unpolluted as possible. By fully implementing the stormwater pollution preventing BMPs described in this section this goal will be achieved.

If a staff worker or crew is unclear on how to perform either a work task or how to implement the stormwater pollution preventing BMPs described here, staff needs to check with supervisors. If a supervisor is not clear on the best way to implement any BMP, he/she should contact King County Water and Land Resources Division (WLRD) Stormwater Services for clarification.

TRASH AND PET WASTE MANAGEMENT

Potential Pollutant Source:

Improperly stored and managed solid waste can leak numerous pollutants, including bacteria and grease, onto the ground. Pet waste left on the ground from dogs and other domestic animals contains high levels of fecal coliform bacteria. Pollutants from trash and animal waste can be carried by stormwater into the King County stormwater system. This polluted stormwater can then enter natural waterways, diminishing their water quality and having harmful ecological effects.

Purpose:

For public health and safety, for aesthetic reasons, and to reduce harmful environmental impacts, solid waste needs to be stored and managed so that pollutants are contained. Pet waste needs to be picked up and properly disposed of. The recommended method of dog waste disposal is for dog owners to bag it in tightly sealed plastic or biodegradable bags. Dog waste should be placed directly into covered trash receptacles. Final disposal of trash and dog waste is in a King County Solid Waste landfill.

Description of BMP:

Trash receptacles in public use areas need to be located to encourage proper trash disposal; heavy foot traffic areas need more receptacles than lighter foot traffic areas.

Trash receptacles need to be emptied in a timely manner, to keep garbage from overflowing.

Trash receptacles need to be kept in good condition, including properly cleaning exteriors when needed, while keeping the cleaning agents and any pollutants, such as grease, from contacting the ground. Receptacles need to

be replaced as needed.

Where feasible, use covered trash receptacles designed to keep their contents secure from birds and rodents.

Pet waste information stations need to be placed in public use areas, including King County Parks, to encourage the public to pick up and dispose dog excrement. Information stations may include: signs educating the public on how to dispose dog waste; pet waste bags; and/or nearby trash receptacles into which the public disposes pet waste.

Phase I Permit Requirements Fulfilled by BMP: S5.C.9.b.vii (5) Building exterior cleaning and maintenance (2007 Permit); S5.C.9.e.xiv, Trash and Pet Waste Management (draft 2013-2018 Permit)

Search Words: Trash management; pet waste management; animal waste management; solid waste management.

References and Resources for Additional Information:

King County Department of Natural Resources and Parks, Water and Land Resources Division, *Stormwater Pollution Prevention Manual,* January 2009, Activity Sheet A-8, "Storage of Solid Waste and Food Wastes (Including Cooking Grease) at http://your.kingcounty.gov/dnrp/library/water-and-land/stormwater/stormwater-pollution-prevention-manual/SPPM-Jan09.pdf

King County Department of Natural Resources, Solid Waste Division website, "What Do I Do with Animal Waste?" at http://your.kingcounty.gov/solidwaste/wdidw/material.asp

PRESSURE WASHING

Potential Pollutant Source:

Suspended solids, metals, other materials can be carried into the stormwater conveyance system by pressure washing King County building exteriors, including facades, rooftops and awnings.

Purpose:

Building exteriors, and other large objects, need to be pressure-washed as needed to keep them free of mold and mildew, in good condition, and visually pleasing to the public and County personnel.

Description of BMP:

If soaps or detergents are used, a water collection device must be used to collect the washwater and whatever is in it. This washwater must be disposed of properly. Contact your supervisor to determine if the washwater can be transported and disposed of at a King County Industrial Waste facility or disposed of in another acceptable manner.

If only pressure washwater is used (no soap or detergent), the washwater need not be collected. It may be allowed to run into landscaped areas and infiltrate into soil. Take measures to ensure the washwater does not mobilize soil out of landscaped areas. Also take measures to ensure large particles do not enter nearby catch basins.

If pressure washing on a grassed area (with or without soap), runoff must be dispersed as sheet flow, rather than a concentrated stream. The washwater must infiltrate into the grass, not drain to pavement or the stormwater system.

If heavy metals are expected in paint on old surfaces, consider hiring a commercial pressure washing service to collect, test and properly dispose washwater.

Phase I Permit Requirements Fulfilled by BMP:

S5.C.9.b.vii (5) Building exterior cleaning and maintenance.

Search Words: Pressure washing; building exterior cleaning.

References and Resources for Additional Information:

King County Department of Natural Resources, King County Stormwater Pollution Prevention Manual, January 2009, Activity Sheet A-15, "Pressure Washing of Buildings, Rooftops, and Other Large Objects" at http://your.kingcounty.gov/dnrp/library/water-and-land/stormwater/stormwater-pollution-prevention-manual/SPPM-Jan09.pdf

King County Industrial Waste at http://www.kingcounty.gov/environment/wastewater/IndustrialWaste/DischargeApprovalOverview.aspx

King County Roads Decant Program at http://directory.kingcounty.gov/ServiceDetail.asp?ServiceID=6743

BUILDING REPAIR AND PAINTING

Potential Pollutant Source: Toxic hydrocarbons contained in solvents, other toxic organic compounds, suspended solids, metals, abnormal pH and oils and greases could be transported off King County properties by stormwater runoff.

Purpose: Repairs are necessary on King County buildings and properties to ensure County work activities can be safely and efficiently conducted. Painting is necessary to keep buildings protected from the weather and for appearances.

Description of BMPs: Repairs, construction and painting tasks will be performed such that discharge of the above potential pollutants will be minimized. No substance shall be dumped on the pavement, ground, or near a storm drain or drainage ditch.

When possible, drop cloths should be used underneath outdoor painting, scraping and sandblasting work.. An alternative to using drop cloths is to thoroughly vacuum materials from paved surfaces. Materials collected on drop cloths or by vacuuming are to be properly disposed of.

Drop cloths or secondary containment will be used for activities such as paint mixing and tool cleaning; washwater will be properly disposed of.

Use covers, filter fabric or similar devices, such as a wet vacuum, to capture and control dust, grit, washwater or other pollutants from escaping the work area and entering the stormwater system. Dispose material properly.

Contact your supervisor to determine if the materials need to be transported and disposed of at a King County Industrial Waste facility.

Phase I Permit Requirements Fulfilled by BMP: S5.C.9.b.vii (5) Building exterior cleaning and maintenance.

Search Words: Building repair; building construction; repairs; construction; painting.

References and Resources for Additional Information:

King County Department of Natural Resources, *King County Stormwater Pollution Prevention Manual*, January 2009, Activity Sheet A-29, "Building Repair, Remodeling and Construction" at http://your.kingcounty.gov/dnrp/library/water-and-land/stormwater/stormwater-pollution-prevention-manual/SPPM-Jan09.pdf

King County Industrial Waste at http://www.kingcounty.gov/environment/wastewater/IndustrialWaste/DischargeApprovalOverview.aspx

CLEANING SIDEWALKS, DRIVEWAYS PARKING LOTS AND VEHICLE STORAGE AREAS

Potential Pollutant Source:

King County parking lots and vehicle storage areas have the potential to contaminate stormwater runoff with hydrocarbons, other organic compounds, oils and greases, metals, nutrients and suspended solids.

Litter accumulation on sidewalks on King County properties and in ROWs can contribute suspended solids to stormwater runoff.

Sidewalks near driveways can contribute hydrocarbons, oil and grease, and metal contaminants.

Herbicides and pesticides, if used near sidewalks, may also be introduced into stormwater.

Crack sealants or surface coatings, if used, may also contribute toxic hydrocarbons, oil and grease and metals.

These paved areas are important to target for stormwater pollution prevention control because most of them drain directly to the stormwater conveyance system.

Purpose:

Sidewalks, driveways, vehicle storage areas, and parking lots need to be maintained free of pollutants, debris, and other materials for safety, environmental and aesthetic purposes.

Description of BMPs:

Sweep sidewalks, driveways, vehicle storage areas and parking lots as needed to collect loose dirt and debris; *do not* hose muddy or debris-laden areas down or push mud/debris into the street or MS4. Pressure washing with water only may be employed to remove grime and mold.

If washing is necessary, do so in small “spots”, rather than the entire area. Do not use soaps or detergents to wash sidewalks and parking lots.

If it is necessary to both pressure wash and use soaps or cleaners on sidewalks and other paved areas, the washwater should be collected and disposed of to the sanitary sewer or taken off site for appropriate disposal.

Clean up fuel, oil and antifreeze spills with absorbent materials; dispose of

these properly.

Use deicing salts and sands sparingly (shoveling snow is preferred to dumping excessive amounts of deicing materials). Residues of deicing materials should be swept up after the snow and ice melts and disposed of properly if reuse is not possible. Sand should be swept up after ice melts and may be re-used.

Also Refer to SiMPla BMPs: Pressure Washing; Street Sweeping

Phase I Permit Requirements Fulfilled by BMP: S5.C.9.b.vii (5) Building exterior cleaning and maintenance.

Search Words: Sidewalk cleaning; parking lot cleaning; driveway cleaning; vehicle storage area cleaning.

References and Resources for Additional Information:

King County Department of Natural Resources, *King County Stormwater Pollution Prevention Manual*, January 2009, Activity Sheet A-15, "Pressure Washing of Buildings, Rooftops, and Other Large Objects"; Activity Sheet A-31, Activity Sheet A-32, "Sidewalk Maintenance"; "Activity Sheet A-31, "Vehicle Equipment Parking and Storage" at http://your.kingcounty.gov/dnrp/library/water-and-land/stormwater/stormwater-pollution-prevention-manual/SPPM-Jan09.pdf

Regional Road Maintenance Technical Working Group (Western Washington/Puget Sound), *Regional Road Maintenance ESA Guidelines*, 2003, Part 1, Regional Program Elements, Maintenance Category #8, Street Surface Cleaning.
http://www.kingcounty.gov/transportation/kcdot/Roads/Environment/RegionalRoadMaintenanceESAGuidelines.aspx
Washington State Department of Ecology, *Stormwater Management Manual for Western Washington*, Vol. IV, Chapter 2, 2-48, "BMPs for Parking and Storage of Vehicles and Equipment".

King County Industrial Waste at
http://www.kingcounty.gov/environment/wastewater/IndustrialWaste/DischargeApprovalOverview.aspx

King County Roads Decant Program at
http://directory.kingcounty.gov/ServiceDetail.asp?ServiceID=6743

SOLID WASTE HANDLING & STORAGE

Potential Pollutant Sources:

Contaminants can run off or leach from improperly maintained solid waste storage areas. These pollutants can harm natural ecosystems.

Purpose:

County workers must store solid waste as they carry out work tasks. Solid waste storage areas need to be properly managed to keep all site stormwater runoff clean.

Description of BMPs:

Use signs to clearly designate solid waste storage areas.

Make sure these areas have berms, etc. as needed to prevent or filter stormwater runoff from carrying off pollutants.

Regularly inspect and sweep, shovel and/or vacuum clean the pavement around these areas. Do NOT hose muddy or debris-covered pavement down. If pressure washing of selected pavement areas is needed, follow the BMPs listed in “Pressure Washing” and “Cleaning Sidewalks, Driveways, Parking Lots and Vehicle Storage Areas”.

Keep solid waste storage areas covered and protected from the rain whenever feasible. Regularly inspect covers, roofs, etc. and repair as needed.

Store solid wastes in appropriate containers (dumpsters, etc.).

Dispose of non-hazardous waste items as trash or garbage.

Transfer solid wastes to transfer stations regularly, to prevent them from building up on site.

Recycle as many solid wastes as possible, appropriate and feasible. If materials, including old tires, are washed, a water collection device must be used to collect the washwater and associated solids; collected washwater must be disposed of properly.

Contact your supervisor to determine if hazardous waste can be transported and disposed of at a King County Industrial Waste facility.

Supervisors should train employees in solid waste recognition, identification, handling, storage and disposal procedures.

Phase I Permit Requirements Fulfilled by BMP: S5.C.9.b.vii (5) Building exterior cleaning and maintenance.

Search Words: Solid waste; trash; recycling.

References and Resources for Additional Information:

King County Department of Natural Resources and Parks, Water and Land Resources Division, *Stormwater Pollution Prevention Manual,* January 2009, Activity Sheet A-8, "Storage of Solid Waste and Food Wastes (Including Cooking Grease) at http://your.kingcounty.gov/dnrp/library/water-and-land/stormwater/stormwater-pollution-prevention-manual/SPPM-Jan09.pdf

King County Industrial Waste at http://www.kingcounty.gov/environment/wastewater/IndustrialWaste/DischargeApprovalOverview.aspx

King County Industrial Waste at http://www.kingcounty.gov/environment/wastewater/IndustrialWaste/DischargeApprovalOverview.aspx

King County Solid Waste Division, "What Do I Do With…?" at http://your.kingcounty.gov/solidwaste/wdidw/

STOCKPILE HANDLING & STORAGE

Potential Pollutant Sources:

Silts and sediment can run off improperly maintained sand, gravel and street sweeping stockpile storage areas. Excess sediment from stockpiles can block stormwater system drainage and harm natural ecosystems.

Purpose:

County activities require that sand, gravel, washed rock and similar materials (including street sweepings) be collected and stored in stockpiles. These stockpile areas need to be properly managed to keep all site stormwater runoff clean. Prevent sediment from leaving the site in any of these manners: overland stormwater flow; vehicle tracking; or stormwater flowing directly into the storm drain system.

Description of BMPs:

Select stockpile areas so that there's less chance for sediment to run off and more chance to control it. When possible: locate piles on flat or gently-graded ground; far from catch basins, sensitive areas and natural waterways; and away from site boundaries (closer to the middle of work sites).

Identify stockpile areas with signs that state what's stored in each pile.

Keep stockpiles properly covered and protected from the rain, as appropriate, to keep silt and sand from being mobilized out of the piles.

Regularly inspect stockpile covers, roofs, etc. Maintain or repair as needed.

Make sure these areas have berms as needed to prevent stormwater runoff from carrying sediments.

Where practical, install socks in catch basins located nearby to protect and filter stormwater in case sediment does get into it. Follow manufacturer instructions. Regularly inspect, clean and replace socks as needed (*don't wait* until they're full of sediment and torn).

Regularly inspect areas around stockpiles to make sure they're clean.

Sweep, shovel and/or vacuum to clean the pavement in these areas. Do NOT hose pavement down.

Phase I Permit Requirements Fulfilled by BMP:	S5.C.9.b.vii (5) Building exterior cleaning and maintenance.
Search Words:	Stockpiles; stockpile management.
References and Resources for Additional Information:	King County Department of Natural Resources and Parks, Water and Land Resources Division, *Stormwater Pollution Prevention Manual,* January 2009, at http://your.kingcounty.gov/dnrp/library/water-and-land/stormwater/stormwater-pollution-prevention-manual/SPPM-Jan09.pdf

LIQUID MATERIAL HANDLING & STORAGE

Potential Pollutant Sources:

Leaks from containers and drips and spills from vehicle maintenance tasks can introduce pollution to stormwater. Pollutants include cleaning solvents, motor oil, antifreeze, and hydraulic fluids.

Purpose:

Liquid material handling and storage areas need to be properly managed to keep all site stormwater runoff clean. Activities that involve liquids need to be done properly.

Description of BMPs:

Vehicle and Equipment Maintenance BMPs

Conduct vehicle maintenance tasks involving liquids inside (out of the rain) to avoid spilling and leaking these liquids on outside areas.

Monitor all fueling of vehicles and equipment to avoid overflows and leaks.

Use shop practices that limit the chances for leaks, such as: limiting the number of solvent cleaning stations per shop; pre-soak dirty vehicle parts in designated “dirty” solvent prior to using fresh solvent; use fresh cleaning solvent sparingly; use drying racks when drying solvent-cleaned vehicle parts to capture and reuse fresher solvent in drip pans; and use drip plans underneath vehicles for all oil changes.

If leaks are noticed under vehicles, use drip pans to capture leaks immediately, at any location. Properly clean up and dispose all leaked fluids. Repair vehicle leaks as soon as possible.

Handling & Storage BMPs

Keep containers that store vehicle and equipment liquids and others (paints, preservatives, etc.) out of the rain whenever feasible.

Make sure containers are made of materials compatible with their stored liquids (for example, don’t store corrosive liquids in metal drums).

Clearly label containers with weatherproof labels for content, date received,

name of person to be contacted regarding the material, and special storage requirements, if any.

Provide spill containment for stationary tanks.

Place tight-fitting lids on portable containers.

Raise containers off the ground (pallet or similar method that allows for spill control).

Regularly inspect containers, and repair or replace as needed.

Only properly trained or licensed staff should operate vehicles and equipment (forklift, etc.) to reduce chance for leaks and spills.

Store and maintain spill cleanup materials near the liquid material storage area.

Supervisors fully train employees in the proper recycling, handling, transferring and spill clean-up of liquid materials.

Transfer liquid waste to waste stations regularly, to prevent it from building up on site.

Recycle as many liquid wastes as possible, appropriate and feasible.

Contact your supervisor to determine if hazardous waste can be transported and disposed of at a King County Industrial Waste facility.

Phase I Permit Requirements Fulfilled by BMP: S5.C.9.b.vii (5) Building exterior cleaning and maintenance.

Search Words: Liquid material storage; liquid waste; recycling.

References and Resources for Additional Information:

King County Department of Natural Resources and Parks, Water and Land Resources Division, *Stormwater Pollution Prevention Manual,* January 2009, at http://your.kingcounty.gov/dnrp/library/water-and-land/stormwater/stormwater-pollution-prevention-manual/SPPM-Jan09.pdf

King County Industrial Waste at http://www.kingcounty.gov/environment/wastewater/IndustrialWaste/DischargeApprovalOverview.aspx

COUNTY VEHICLE LEAK MANAGEMENT

Potential Pollutant Sources:

Vehicle fluid spills, drips and leaks can impact stormwater. Potential pollutants include motor oil, antifreeze, hydraulic fluids (brake and transmission), windshield wiper fluid, and solvents.

Purpose:

Vehicle storage and maintenance allows County workers to be ready and mobile to safely and efficiently perform their jobs. Vehicle-related tasks need to be conducted so that site stormwater runoff from vehicle areas is kept free of pollutants.

Description of Vehicle Leak BMPs:

Use drip pans to capture leaks when first noted, at any location. Properly clean up and dispose all leaked fluids. Immediately repair leaks or drain the vehicle when a leak is found.

Store and maintain spill cleanup materials near the liquid material storage area.

Supervisors properly train employees in the proper recycling, handling, transferring and spill clean-up of liquid materials.

Conduct vehicle maintenance tasks that involve liquids inside to avoid polluting exterior areas.

Monitor all fueling to avoid overflows and leaks of fuel.

Only properly trained or licensed staff should operate vehicles and equipment (forklift, etc.) to reduce chance for leaks and spills.

Also Refer to SiMPla BMPs: Spill Control.

Phase I Permit Requirements Fulfilled by BMP: S5.C.9.b.vii (5) Building exterior cleaning and maintenance.

Search Words: Spill control; vehicle leaks; vehicle storage; vehicle fueling.

References and Resources for Additional Information:

King County Department of Natural Resources and Parks, Water and Land Resources Division, *Stormwater Pollution Prevention Manual,* January 2009, at http://your.kingcounty.gov/dnrp/library/water-and-land/stormwater/stormwater-pollution-prevention-manual/SPPM-Jan09.pdf

King County Industrial Waste at http://www.kingcounty.gov/environment/wastewater/IndustrialWaste/DischargeApprovalOverview.aspx

California Stormwater Quality Association, *California Stormwater BMB Handbook*, "Spill Prevention, Control & Cleanup SC-11", at http://www.cabmphandbooks.com/documents/industrial/sc-11.pdf

COUNTY VEHICLE WASHING

Potential Pollutant Sources:

Detergents, soaps, cleaners, grease, metal particles, and other solids carried offsite in vehicle washwater are all pollutants.

Purpose:

Washing of County vehicles needs to be done so that oily, greasy and dirty vehicles don't release these built-up pollutants to the environment when it rains. Also it's important to keep vehicles clean for safety purposes and to keep up good appearances for our public.

Description of Washing BMPs:

Wash all King County vehicles at designated wash racks or car washes; at King County wash racks properly treat washwater before discharging it.

Rinse lawn clippings off lawn mowers so that they won't enter the storm drain system; oily or contaminated washwater must be discharged to the sanitary sewer.

Regularly inspect vehicle wash racks for cleanliness, functioning, safety and proper wash rack signs.

Note: Only County trucks and equipment are washed at wash racks; wash private vehicles and County passenger cars at vendor car washes.

Phase I Permit Requirements Fulfilled by BMP:

S5.C.9.b.vii (5) Building exterior cleaning and maintenance.

Search Words: Vehicle washing; washing cars; washing trucks.

References and Resources for Additional Information:

King County Department of Natural Resources and Parks, Water and Land Resources Division, *Stormwater Pollution Prevention Manual,* January 2009, at http://your.kingcounty.gov/dnrp/library/water-and-land/stormwater/stormwater-pollution-prevention-manual/SPPM-Jan09.pdf

King County Industrial Waste at http://www.kingcounty.gov/environment/wastewater/IndustrialWaste/DischargeApprovalOverview.aspx

SPILL CONTROL

Potential Pollutant Sources:

The following activities increase chances of leaks and spills of pollutants into the stormwater system: fueling of vehicles at King County fueling stations; loading and unloading bulk materials and liquids; and storing and handling materials.

Purpose:

In order to perform their work, King County employees fuel vehicles, load and unload bulk materials, and store and use liquid and solid materials. These activities can lead to leaks and spills of pollutants like fuel, oils, greases, toxic wastes, solvents, fertilizers, detergents, etc. All these must be properly controlled and cleaned up to keep them out of the stormwater system.

Description of BMPs:

Note: for spills that pose **an immediate threat to human health or the environment** call **911** Notify the King County Water Quality Complaint Line at **206-296-1900**. If in King County Roads' jurisdiction, call Roads also at **206-296-8100**.. Note: Division-specific spill notification procedures should be followed.

To avoid spills and leaks in the first place, employees must be trained in the proper recycling, handling, transferring, and storage of materials.

Spill response actions, including containment and cleanup, should be conducted only by trained spill responders. Spill responders need to be able to properly identify spills and their significance (ranging from non-significant to life-threatening). Cleanup of any spill is to be done only by properly trained spill responders.

Keep spill kits fully-stocked and available at all times near fueling stations, bulk loading/unloading areas, and material storage and usage areas. (When spill kits are fully stocked and close at hand, spills can be quickly controlled and cleaned up.)

On paved surfaces, clean up spills with as little water as possible. Use a rag

for small spills, a damp mop for general cleanup, and absorbent material for larger spills. Dry materials should be cleaned up with brooms, shovels, sweepers or front end loaders. Any cleaned up hazardous materials that are unusable must be handled/disposed of as hazardous waste.

Establish a tracking system for incidents, to identify types and quantities of spills; patterns in time occurrence; description of accidents/spills.

Regularly maintain fueling station tanks, pipes and dispensers in accordance with site-specific fuel station operations and maintenance manuals and any required Spill Prevention, Control and Countermeasure (SPCC) plans.

Maintain fueling station records.

Also Refer to SiMPla BMPs: Vehicle Leak Management.

Phase I Permit Requirements Fulfilled by BMP: S5.C.9.b.vii (5) Building exterior cleaning and maintenance.

Search Words: Spill control; vehicle leaks; vehicle storage; vehicle fueling.

References and Resources for Additional Information:

King County Department of Natural Resources and Parks, Water and Land Resources Division, *Stormwater Pollution Prevention Manual,* January 2009, at http://your.kingcounty.gov/dnrp/library/water-and-land/stormwater/stormwater-pollution-prevention-manual/SPPM-Jan09.pdf

King County Industrial Waste at http://www.kingcounty.gov/environment/wastewater/IndustrialWaste/DischargeApprovalOverview.aspx

California Stormwater Quality Association, *California Stormwater BMB Handbook*, "Spill Prevention, Control & Cleanup SC-11", at http://www.cabmphandbooks.com/documents/industrial/sc-11.pdf

BMPs FOR MAINTENANCE AND OPERATIONS OF MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4)

King County
Site Management Plan (SiMPla)

May 2012

King County

Department of Natural Resources and Parks
Water and Land Resources Division
Stormwater Services Section
King Street Center, KSC-NR-0600
201 South Jackson Street, Suite 600
Seattle, WA 98104
206-296-6519 TTY Relay: 711
www.kingcounty.gov/stormwater

Introduction
BMPs for Maintenance and Operation of MS4

The stormwater pollution-prevention BMPs in this section should be implemented when the following work tasks are performed to keep the County's municipal separate storm sewer system (MS4) functioning:

- Cleaning catch basins
- Maintaining ditches
- Cleaning "enclosed conveyances" (pipes, tiles and culverts)
- Cleaning and maintaining detention/retention/water quality ponds
- Maintaining infiltration facilities (ponds, tanks, vaults, corridors and basins)
- Cleaning and maintaining water quality features (treatment ponds, catch basins, sand filters and bioswales)
- Maintaining rain gardens (for both flow control and water quality treatment)

The BMPs in this section describe the necessity of performing the work tasks, as well as how to do the work so that stormwater flowing over and off County work areas is kept as clean and unpolluted as possible. By fully implementing the stormwater pollution-preventing BMPs described in this section this goal will be achieved.

If a staff or subcontractor worker or crew is unclear on how to perform either a work task or how to implement the stormwater pollution-preventing BMPs described here, staff needs to check with supervisors. If a supervisor is not clear on the best way to implement any BMP, he/she should contact King County Water and Land Resources Division (WLRD) Stormwater Services for clarification.

General Best Maintenance Practices: While doing work in or near King County's MS4, there is potential for erosion and sedimentation to occur. Sediment suspended and carried by rinsing/flushing water or stormwater has the potential to be carried into the downstream natural water body (lake, stream or river). Implement these BMPs:

1. Perform maintenance work under dry conditions (no stormwater flow).
2. When work must be performed under wet conditions (stormwater flow), prevent stormwater from entering the work area by installing plugs in inlet pipes, or using bypasses or pumps to temporarily divert the flow of water.
3. Install downstream/outlet plugs or blocks to temporarily capture turbid water; pump this water out and remove outlet plug or restore natural flow when the maintenance task in that work area is complete.
4. Follow work task-specific BMPs/maintenance processes, as included in this manual.

CATCH BASIN CLEANING

Potential Pollutant Source:

Sediment and trash in catch basins can contribute contaminants such as suspended solids, metals, oils and grease and other harmful materials to stormwater runoff.

Purpose of Catch Basin Cleaning & Maintenance:

Catch basins, as important parts of the County's stormwater conveyance system, should be routinely checked for cleanliness and functioning. Clearing them of sediment and debris allows stormwater to flow freely and also helps prevent stormwater contamination. King County typically uses vactor trucks to clean catch basins.

Description of BMPs:

Inspect and clean catch basins as needed, and also determine if maintenance (repairs or improvements) are needed.

Clean catch basins when the depth of sediments in them reaches 60 percent of the sump depth as measured from the bottom of the basin to the lowest pipe invert (into or out of) the basin. In catch basins with 12" or greater sumps, cleaning is required when there is less than six inches clearance from debris or sediment surface to the lowest pipe invert. (Note: Some catch basins were not designed for settling of sediments. These may have sumps less than 12" in depth. These are known colloquially as "peanut basins" and will need to be cleaned as individual catch basin conditions require.)

When possible, to prevent stormwater from entering the work area, install plugs in inlet pipes, or use bypasses or pumps to temporarily divert the flow of water.

When possible, install downstream/outlet plugs or blocks to temporarily capture stormwater and/or rinse water; pump this water out and remove outlet plug or restore natural flow when the maintenance task in that work area is complete.

Clean woody debris in catch basins as often as needed to maintain catch basin function.

Post warning signs or stencil on or adjacent to storm drains, saying "Dump No Waste – Drains to Stream," etc., where practical.

Follow necessary safety and personal protection guidelines when using a vactor truck to clean catch basins, including placing traffic control devices as needed.

Vacuum debris and sediment with vactor truck apparatus, checking vactor truck water tank level to keep pump from running dry.

If needed, use high pressure hose water to clean sides/bottom of catch basin.

Vacuum rinse water up.

Stow hoses when done.

Remove traffic control devices.

Move to next catch basin.

Also Refer to SiMPla BMPs:

Empty holding tank when full, or at shift end. Disposal of sediments and liquids from catch basins must comply with applicable regulations.

Enclosed Conveyance Cleaning; Pipe Cleaning.

Phase I Permit Requirements Fulfilled by BMP:

S5.C.9.b.vi (1), Pipe cleaning.

Search Words:

Catch basins; cleaning catch basins.

References and Resources for Additional Information:

King County Department of Transportation, *Draft Maintenance Performance Standards*, April 2008, the following:
Performance Standard 241, "Clean CB/Manholes-Vactor";
Performance Standard 244, "Clean Drainage Systems-Equipment"; and
Performance Standard 245, "Clean Drainage Systems - Hand".

Regional Road Maintenance Technical Working Group (Western Washington/Puget Sound), *Regional Road Maintenance ESA Guidelines*, 2003, Part 1, Regional Program Elements, Maintenance Category #2, Enclosed Drainage Systems.
http://www.kingcounty.gov/transportation/kcdot/Roads/Environment/RegionalRoadMainte

nanceESAGuidelines.aspx

Washington State Department of Ecology, *Stormwater Management Manual for Western Washington*, Vol. IV, Chapter 2, 2-40, "BMPs for Maintenance of Stormwater Drainage and Treatment Systems".

DITCH MAINTENANCE

Potential Pollutant Source:

Sediment could enter stormwater system due to soil-disturbing activities. For BMPs to prevent this, refer to the *Erosion Control* section in this document.

Purpose of Ditch Maintenance:

Ditches need to be routinely maintained to ensure roadside stormwater drainage meets the flow control standards set in the King County Surface Water Design Manual. New stormwater ditches need to be cut when necessary.

Ditch excavation is done as needed for proper stormwater drainage. **Hand ditching** is done when it is impractical to use machinery to remove leaves, debris, grass or silt from ditches.

Bucket ditching is done for deep ditches; for short distances between culverts; and for spot cleaning.

Shoulder cleaning is done to reshape and clean roadside ditches, including removing excess sod from the shoulder.

Description of BMPs:

When possible, to prevent stormwater from entering the work area, install plugs in inlet pipes, or use bypasses or pumps to temporarily divert the flow of water.

When possible, install downstream/outlet plugs or blocks to temporarily capture turbid water; pump this water out and remove outlet plug or restore natural flow when the maintenance task in that work area is complete.

When possible, perform ditch maintenance in segments (phases) so that only a section of the ditch is disturbed at any one time (known as “skip ditching”).

Install temporary stabilization measures such as hydroseeding or coir mats to prevent soil from exposed sides and bottom of ditch from being mobilized

into stormwater flow.

Follow necessary safety and personal protection guidelines when hand or bucket ditching, shoulder cleaning or excavating ditches.

Place traffic control devices as needed.

When **ditch excavating**, cut new ditch using appropriate equipment (typically backhoe and haul truck).

When **hand ditching**, use hand tools (shovels, etc.) to manually remove leaves, debris, grass, sod or silt from ditches.

When **bucket ditching**, remove material with the appropriate equipment (backhoe, excavator or front end loader); open culverts as necessary.

When **shoulder cleaning** (blade ditching/shoulder pulling), remove sediment and debris from ditch with grader.

Load/haul/dispose material per specific site work plan.

Clean area and remove traffic control devices.

Also Refer to SiMPla BMPs: *Erosion Control* section, and Mowing.

Phase I Permit Requirements Fulfilled by BMP:
S5.C.9.b.vi (3), Ditch maintenance.
S5.C.9.b.vi (8), Maintaining roadside areas, including vegetation management.
S5.C.9.b.vii (3), Landscape maintenance and vegetation disposal.

Search Words: Ditch maintenance; ditch excavation; hand ditching; bucket ditching; blade ditching; shoulder cleaning; shoulder pulling.

References and Resources for Additional Information:

IPM Associates, Inc, Eugene, Oregon, "*Report on Integrated Roadside Vegetation Management*", prepared for King County, Washington, Department of Public Works, Roads and Engineering Division, Renton, WA, February 1994.

King County Department of Natural Resources, *King County Stormwater Pollution Prevention Manual*, January 2009, Activity Sheet A-26, "Landscaping Activities and Vegetation Management".

King County Department of Transportation, *Draft Maintenance Performance Standards*, April 2008, the following:
Performance Standard 234, "Hand Ditching"

Performance Standard 242, "Shoulder Cleaning"
Performance Standard 269, "Landscape Maintenance"
Performance Standard 288, "Bucket Ditching"

Regional Road Maintenance Technical Working Group (Western Washington/Puget Sound), *Regional Road Maintenance ESA Guidelines*, 2003, Part 1, Regional Program Elements, Maintenance Category #15, Vegetation.
http://www.kingcounty.gov/transportation/kcdot/Roads/Environment/RegionalRoadMaintenanceESAGuidelines.aspx
Washington State Department of Ecology, *Stormwater Management Manual for Western Washington*, Vol. IV, Chapter 2, 2-23, "BMPs for Landscaping and Lawn/Vegetation Management".

ENCLOSED CONVEYANCE (PIPE) CLEANING

Potential Pollutant Source:

Sediment and trash in the stormwater conveyance system can contribute contaminants such as suspended solids, metals and other materials to stormwater runoff.

Purpose of Pipe Cleaning:

All openings to drain tile, frontage tile, cross culverts and approaches to closed systems should be routinely checked. Clearing openings of brush, debris and spoil material allows stormwater to flow freely and helps prevent stormwater contamination.
Hand cleaning is done with miscellaneous hand tools.
Equipment cleaning is done with a vactor truck or water truck.

Description of BMPs:

Inspect pipes (including culverts) regularly, and determine if repairs or improvements are needed to maintain function.

Promptly repair any defect, such as lack of rock in emergency spillways.

Regularly remove debris and sludge from pipes as needed.

Follow necessary safety and personal protection guidelines when cleaning pipes and culverts, and clearing openings.

Place traffic control devices as needed.

When possible, to prevent stormwater from entering the work area, install plugs in inlet pipes, or use bypasses or pumps to temporarily divert the flow of water.

When possible, install downstream/outlet plugs or blocks to temporarily capture stormwater and/or rinse water; pump this water out and remove outlet plug or restore natural flow when the maintenance task in that work area is complete.
When hand cleaning, cut back brush and/or clear pipe openings as required to allow free flow.

When cleaning pipes with equipment, insert jet rodder hose and move back and forth until sediment is discharged and pipe is clean.

Vacuum rinse water up.

Clean area and remove traffic control devices.

Empty vactor truck holding tank when full, or at shift end. Disposal of sediments and liquids from catch basins must comply with applicable regulations.

Also Refer to SiMPla BMPs: Catch basin cleaning; Ditch maintenance; Mowing.

Phase I Permit Requirements Fulfilled by BMP: S5.C.9.b.vi (1), Pipe cleaning; and (2), Cleaning of culverts that convey stormwater in ditch systems.

Search Words: Pipe cleaning; culvert cleaning; enclosed conveyance cleaning.

References and Resources for Additional Information:

King County Department of Transportation, *Draft Maintenance Performance Standards*, April 2008, the following:
Performance Standard 244, "Clean Drainage Systems-Equipment"
Performance Standard 245, "Clean Drainage Systems - Hand"
Regional Road Maintenance Technical Working Group (Western Washington/Puget Sound), *Regional Road Maintenance ESA Guidelines*, 2003, Part 1, Regional Program Elements, Maintenance Category #2, Enclosed Drainage Systems.
http://www.kingcounty.gov/transportation/kcdot/Roads/Environment/RegionalRoadMaintenanceESAGuidelines.aspx
Washington State Department of Ecology, *Stormwater Management Manual for Western Washington*, Vol. IV, Chapter 2, 2-40, "BMPs for Maintenance of Stormwater Drainage and Treatment Systems".

RETENTION/ DETENTION/ WATER QUALITY POND CLEANING AND MAINTENANCE

Potential Pollutant Source: Oil and grease, hydrocarbons, debris, heavy metals, sediments and contaminated water can be found in stormwater retention and detention ponds.

Purpose of Pond Cleaning & Maintenance: Retention/detention ponds need to be maintained to ensure their proper function in both controlling stormwater flow and helping to remove pollutants from stormwater.

Description of BMPs: Follow necessary safety and personal protection guidelines when cleaning and maintaining ponds.

Inspect all components of ponds regularly for maintenance requirements, and note if any repairs or improvements are needed to maintain function (cracks in pipes, etc.).

Trash and debris: remove from the pond and from sideslopes and upland areas.

Contaminants and pollution (oil, gasoline, concrete slurries, paint, etc.): remove and dispose properly; implement measures to prevent further contamination from happening.

Mow grass or groundcover over 18 inches in height to a height no greater than 6 inches.

Noxious weeds: if hazardous to County personnel or the public, remove according to King County noxious weeds regulations.

Erosion on sideslopes: stabilize with appropriate erosion control measures (see SiMPla Erosion Control BMPs); civil engineer may need to be consulted if erosion occurring on compacted slope.

Outlet or inlet pipes: remove sediment that fills over 20% of the pipes.

Inlet(s): inspect for scour and stabilize as needed.

Outlet structure: inspect and remove debris blockages.

When possible and appropriate, prevent stormwater from entering the work area by installing plugs in inlet pipes, or by using bypasses or pumps to temporarily divert the flow of water.

When possible and appropriate, install downstream/outlet plugs or blocks to temporarily capture turbid water; pump this water out and remove outlet plug or restore natural flow when the maintenance task in that work area is complete.

Pond storage area: remove sediment that fills over 10% of the designed depth. Dispose/recycle sediments according to solid disposal regulations.

Pond storage area: if needed, install jute mat, filter fabric, hydroseed or other erosion control/sedimentation measures to stabilize pond surfaces and keep soil from being suspended into stormwater.

Pond liner: if it is visible or not holding water, repair or replace.

Shoreline/sideslopes: inspect for erosion, and stabilize as needed.

Rodent holes or dams: look for and remove holes or dams and destroy rodents.

Trees growing on sideslopes: remove only if they threaten pond side slope integrity or interfere with access or maintenance (otherwise trees can stay).

Trees growing in emergency overflow or spillway: remove.

Sufficient rock pad (energy dissipater) missing from emergency overflow/spillway: restore rock to design standards.

Settlement of dam, berm, or embankment: if minor, restore to design standards; if significant, consult civil engineer.

Also Refer to SiMPla BMPs: Ditch maintenance; Mowing; *Erosion Control Section*.

Phase I Permit Requirements Fulfilled by BMP: S5.C.9.b.vii (3), Landscape maintenance and vegetation disposal.

Search Words: Pond cleaning; pond maintenance; water quality facility.

References and Resources for Additional Information:

King County Department of Natural Resources and Parks, Washington, *Surface Water Design Manual*, Appendix A, "Maintenance Requirements for Flow Control, Conveyance and WQ Facilities", "No. 1 – Detention Ponds", at http://your.kingcounty.gov/dnrp/library/water-and-land/stormwater/surface-water-design-manual/SWDM-2009.pdf

Washington State Department of Ecology, *Stormwater Management Manual for Western Washington*, Vol. IV, Chapter 2, 2-40, "BMPs for Maintenance of Stormwater Drainage and Treatment Systems".

TANK AND VAULT CLEANING AND MAINTENANCE

Potential Pollutant Source:

Oil and grease, hydrocarbons, debris, heavy metals, sediments and contaminated water can be found in vaults.

Purpose of Tank and Vault Cleaning & Maintenance:

Detention tanks and vaults need to be cleaned of accumulated sediments and debris, both to keep their flow control function and to help keep pollutants out of the stormwater conveyance system.

Description of BMPs:

Follow necessary safety and personal protection guidelines when inspecting, cleaning and maintaining vaults.

Regularly inspect vault tank structure for vent blockages; bending out of shape; gaps, damaged joints or cracks; and damage to vault wall, frame, bottom and/or top slab. Repair defects/damage.

Trash and debris at site and in vault: remove.

Sediment accumulated–remove when

A. Tanks: Sediment exceeds 10% of the diameter of the storage area for ½ the length (Example: A 72-inch storage **tank** would require cleaning when sediment reaches a depth of about 7 inches for more than ½ the length of the tank); *or*

B. Tanks: Sediment exceeds 15% of the diameter at any point. (Example: A 72-inch storage **tank** would require cleaning when sediment at any point reaches a depth of about 11 inches); *or*

C. Tanks and Vaults: Sediment accumulated in inlet/outlet pipes: Remove when it fills 20% or more of the pipe.

Contaminants and pollution (such as oil, gasoline, concrete slurries or paint) at site or in vault: remove and dispose according to applicable regulations, and implement measures to prevent further contamination.

	Grass/groundcover at site exceeding 18 inches high: mow or hand brush to less than 6 inches high.
Also Refer to SiMPla BMPs:	Detention/Retention/Water Quality Pond Cleaning & Maintenance; Enclosed Conveyance (Pipe) Cleaning.
Phase I Permit Requirements Fulfilled by BMP:	Vaults are not specifically called out; closest reference is S5.C.9.b.vi (1), Pipe cleaning.
Search Words:	Tank cleaning; tank maintenance; vault cleaning; vault maintenance.
References and Resources for Additional Information:	King County Department of Natural Resources and Parks, Washington, *Surface Water Design Manual*, Appendix A, "Maintenance Requirements for Flow Control, Conveyance and WQ Facilities", "No. 3 – Detention Tanks and Vaults", at http://your.kingcounty.gov/dnrp/library/water-and-land/stormwater/surface-water-design-manual/SWDM-2009.pdf Washington State Department of Ecology, *Stormwater Management Manual for Western Washington*, Vol. IV, Chapter 2, 2-40, "BMPs for Maintenance of Stormwater Drainage and Treatment Systems".

INFILTRATION FACILITIES (PONDS, TANKS, VAULTS, CORRIDORS, BASINS)

Potential Pollutant Source:

Oil and grease, hydrocarbons, debris, heavy metals, sediments and contaminants in stormwater could enter infiltration systems.

Purpose of BMPs:

Infiltration facilities include ponds, tanks, vaults, corridors and basins, all of which allow stormwater to percolate directly into subsurface soils. Cleaning and maintenance ensure that these facilities function per design to control flow, and also help keep contaminants from entering groundwater.

Description of BMPs:

Follow necessary safety and personal protection guidelines when inspecting, cleaning and maintaining infiltration facilities.

Trash/debris: remove from site, ponds, tanks, vaults, pipes, etc.

Noxious weeds: if a danger to County workers or the public, remove according to County noxious weed regulations.

Contaminants/pollution (including oil, gasoline, concrete slurries, and paint): Remove and dispose in accordance with regulations.

Grass/groundcover: if over 18 inches high, mow to a height less than six inches.

Infiltration pond, tank, vault, corridor, catch basin, basin—

- Sediment accumulation: Remove sediment if 2 or more inches of sediment is present, or if percolation tests show facility is working at or less than 90% of design.
- Filter bags: replace if filter bag more than ½ full.
- If washed rock is part of specific design, and is no longer allowing infiltration per design standards, remove old rock and replace with new washed rock.

Infiltration ponds—

- Rodent holes in side slope, dam, berm or embankment: repair rodent damage and destroy rodents.
- Erosion in side slope, dam, berm or embankment: eroded damage over 2 inches deep, or continuing erosion—stabilize soils. If eroding on compacted slope, consult civil engineer.
- Settlement: If dam, berm or embankment has settled more than 4 inches, restore to design dimensions. If significant settlement, consult civil engineer.
- Rock filter plugged: replace rock filter; if rock filter not needed, remove.
- Emergency overflow spillway: if rock is missing, restore to design standards. If tree growth impedes flow or threatens spillway stability, remove trees.

Tank structure and components—plugged air vents; tank bent out of shape; gaps, damaged joints or cracks; access manhole or large access doors/plate problems: Remedy/repair any of these. **Any open manhole requires immediate maintenance.**

Vault structure—damage to wall, frame, bottom and/or top slab: repair as needed.

Inlet/outlet pipes—Sediment accumulation: remove sediment if filling 20% or more of pipe.

Also Refer to SiMPla BMPs: Enclosed Sand Filter Maintenance; Catch Basin Cleaning; Pipe Cleaning; Retention/Detention Pond Cleaning and Maintenance; Tank and Vault Cleaning and Maintenance.

Phase I Permit Requirements Fulfilled by BMP: Infiltration facilities are not specifically called out; closest references are S5.C.9.b.vi (1), Pipe cleaning; and S5.C.9.b.vii (3), Landscape maintenance and vegetation disposal..

Search Words: Infiltration facilities.

References and Resources for Additional Information:

King County Department of Natural Resources and Parks, Washington, *Surface Water Design Manual*, Appendix A, "Maintenance Requirements for Flow Control, Conveyance and WQ Facilities", "No. 2 – Infiltration Facilities", at http://your.kingcounty.gov/dnrp/library/water-and-land/stormwater/surface-water-design-manual/SWDM-2009.pdf

Washington State Department of Ecology, *Stormwater Management Manual for Western Washington*, Vol. IV, Chapter 2, 2-40, "BMPs for Maintenance of Stormwater Drainage and Treatment Systems".

SAND FILTER MAINTENANCE

Potential Pollution Issues:

Sand filters are designed to help remove pollutants such as bacteria and excessive phosphorous from stormwater. Debris, sediment, grass thatch and other materials accumulating in the sand filter can plug up the sand and decrease flow through the sand to the underdrain. This can result in water bypassing the sand filter (not getting water quality treatment) and flowing through the overflow more often. Also, disregarding BMPs during maintenance practices could allow sand or soil to enter the stormwater conveyance system.

Purpose of BMPs:

Inspecting, cleaning and maintaining sand filters allows them to continue operating per design, enabling stormwater to flow through the sand to the underdrain, then out to the stormwater conveyance system downstream. The sand improves water quality by helping remove pollutants. The sand probably needs to be replaced every 4 to 10 years, as it becomes clogged.

Description of BMPs:

Follow necessary safety and personal protection guidelines when inspecting, cleaning, and maintaining sand filters.

Also follow SiMPla BMPs for "Infiltration Facilities", in addition to the following BMPs which are specific to sand filters, where applicable.

Debris/sediment: remove from **pretreatment facility** when depth exceeds 12 inches.

Debris/sediment: remove from **surface of sand filter** when depth exceeds 0.5 inch.

Inspection/maintenance: normally a sand filter should be empty of stormwater within 9 to 24 hours of a storm event; if not, plugging is indicated and maintenance is needed, including:

- Remove thatch accumulation in grass
- Aerate the filter surface to improve permeability
- Till the filter surface. Two separate passes following a criss-cross

pattern (second pass at right angles to the first).

- Replace upper 4 to 6 inches of grass and sand.

Rapid drawdown in the sand filter (greater than 12 inches/hour, for example) indicates flow is not through the sand but somehow is draining directly to the underdrain; inspect the cleanouts on the underdrain pipes and along the embankment for leaks.

Formation of rills and gullies on the sand surface indicates improper function of the flow spreader; check for accumulation of debris on or in the flow spreader, clean as needed, and refill rills and gullies with sand.

Avoid excessive use of fertilizers in and near a landscape sand filter.

Do not drive heavy machinery on sand filter surface; it compacts the sand, which decreases its filtration capability, and also ruts the surface.

Mow grass as needed; remove cut grass from sand filter.

Water vegetation as needed, especially in dry summer months.

Discourage pet waste by installing signs to remind pet owners of scoop laws, by planting barrier vegetation like barberry, or other measures.

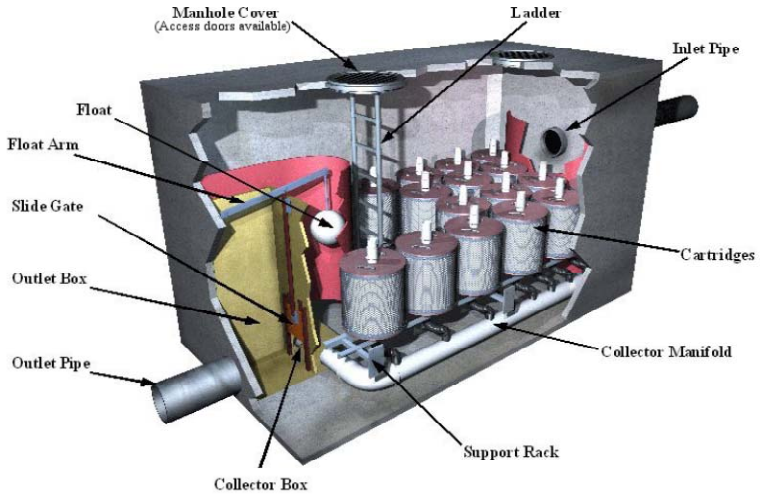
Also Refer to SiMPla BMPs: Infiltration facilities.

Phase I Permit Requirements Fulfilled by BMP: Sand filters are not specifically called out.

Search Words: Sand filters; water quality facilities.

References and Resources for Additional Information: King County Department of Natural Resources and Parks, Washington, *Surface Water Design Manual*, Appendix A, "Maintenance Requirements for Flow Control, Conveyance and WQ Facilities", "No. 19 – Sand Filter Ponds", at http://your.kingcounty.gov/dnrp/library/water-and-land/stormwater/surface-water-design-manual/SWDM-2009.pdf

FILTER MEDIA DEVICE MAINTENANCE



From http://www.ecy.wa.gov/programs/wq/stormwater/newtech/use_designations/CDSGULD81607.pdf

Potential Pollution Issues:

Filter media devices, such as StormFilter®, are flow through stormwater filtration systems for water quality treatment. If not maintained, the intended water quality improvements may not be achieved. Also, disregarding BMPs during maintenance practices could allow pollutants or sediments to enter the stormwater conveyance system.

Purpose of BMPs:

Inspecting, cleaning and maintaining filter media devices allows them to continue to operate per design, enabling stormwater to flow through them and out to the stormwater conveyance system downstream.

Description of BMPs:

Follow necessary safety and personal protection guidelines when inspecting, cleaning and maintaining filter media devices.

Follow specific manufacturer maintenance schedule and detailed tasks.

The operation and maintenance instructions from the manufacturer shall be kept along with an inspection and maintenance log. The log shall be available for review by County inspectors.

Routine maintenance shall include inspecting for debris, vegetation and sediment accumulation, flushing the underdrain, and removing or replacing media.

Sediment on vault floor: if greater than 2 inches, remove sediment.

Sediment on top of cartridges: if greater than 0.5 inch, remove sediment.

	Scum lines on top of cartridges: plugged canisters or manifold; replace as needed.
Also Refer to SiMPla BMPs:	Retention/detention tanks and vaults.
Phase I Permit Requirements Fulfilled by BMP:	Filter media devices are not specifically called out.
Search Words:	Water quality facilities; filter media devices; StormFilter®; media filtration devices.
References and Resources for Additional Information:	King County Department of Natural Resources and Parks, Washington, *Surface Water Design Manual*, Appendix A, "Maintenance Requirements for Flow Control, Conveyance and WQ Facilities", "No. 21 – StormFilter (cartridge type)", at http://your.kingcounty.gov/dnrp/library/water-and-land/stormwater/surface-water-design-manual/SWDM-2009.pdf

BIOSWALE MAINTENANCE

Potential Pollution Issues:

Bioswales are linear vegetated channels intended for water quality treatment. "Dry" bioswales are intended to dry between storms; "wet" bioswales are intended to support wetland plant vegetation year-round and thus to have a small amount of standing water. Typically bioswales are designed so that blades of grass capture and remove sediments and some pollutants from stormwater running off areas such as roads and parking lots. Improperly functioning bioswales won't achieve the water quality improvement intended.

Purpose of BMPs:

Inspecting, cleaning, and maintaining bioswales allows them to continue to operate per design, enabling stormwater to flow through them to the stormwater conveyance system downstream with improved water quality.

Description of BMPs:

Follow necessary safety and personal protection guidelines when inspecting, cleaning and maintaining bioswales.

Remove trash and debris accumulated

- On the bioswale site; *and*
- In the inlet/outlet pipes.

Remove contaminants or pollution such as oil, gasoline, concrete slurries or paint; dispose according to applicable regulations.

Remove sediment accumulation when

- It exceeds a depth of 2 inches over 10% of the swale treatment area (this is the area below the water quality design water depth; typically this depth is a few inches at the bottom of the swale.); *or*
- It inhibits grass growth over 10% of swale length; *or*
- It fills 20% or more of inlet/outlet pipes.

Mow grass when it exceeds a height of 10 inches; remove clippings.

Other bioswale problems include the following; refer to King County Surface Water Design Manual, Appendix A-18 and A-19 for more information (these problems may require design/construction changes):

- Channelization causing erosion of swale;
- Constant flow through the bioswale even when no rain has fallen for weeks;
- Poor vegetation coverage;
- Excessive shade causing poor growth of grass;
- Damage at inlet/outlet pipe joints;
- Vegetation too sparse, not effective at capturing pollutants/sediments (wet bioswale);
- Water depth not retained where designed to be (wet bioswale).

Also Refer to SiMPla BMPs: Infiltration facilities; Mowing.

Phase I Permit Requirements Fulfilled by BMP: Bioswales are not specifically called out; closest reference is S5.C.9.b.vii (3), Landscape maintenance and vegetation disposal..

Search Words: Bioswale; water quality facilities.

References and Resources for Additional Information: King County Department of Natural Resources and Parks, Washington, *Surface Water Design Manual*, Appendix A, "Maintenance Requirements for Flow Control, Conveyance and WQ Facilities", No. A-13 –"Basic Biofiltration Swale (Grass) and No. A-14 "Wet Biofiltration Swale", at http://your.kingcounty.gov/dnrp/library/water-and-land/stormwater/surface-water-design-manual/SWDM-2009.pdf

RAIN GARDEN MAINTENANCE

Seattle Rain Garden

Potential Pollutant Source: Oil and grease, hydrocarbons, debris, heavy metals, sediments and contaminated water are likely carried by stormwater into rain gardens. Improperly performed maintenance tasks could release sediments (and pollutants attached to these sediments) to the stormwater conveyance system.

Purpose of Maintenance: Inspection and maintenance of rain gardens insures they achieve their flow control and water quality treatment design goals, specific to their sites.

Description of BMP: Rain gardens must be inspected annually for physical defects.

After major storm events, a rain garden should be checked to see that its overflow system is working properly.

Erosion channels or bare spots should be stabilized with soil, plant material, mulch, or landscape rock.

Supplemental watering may be needed the first year to ensure the long-term survival of the rain garden's vegetation.

Vegetation should be maintained as follows:

- Replace all dead vegetation as soon as possible;
- Remove fallen leaves and debris as needed;
- Remove all noxious vegetation when discovered; *and*
- Manually weed without herbicides or pesticides.

During drought conditions, use mulch to prevent excess solar damage and water loss.

Also Refer to SiMPla BMPs: Infiltration facilities.

Phase I Permit Requirements Fulfilled by BMP:	Rain gardens are not specifically called out; closest reference is S5.C.9.b.vii (3), Landscape maintenance and vegetation disposal.
Search Words:	Rain garden; bioretention; water quality facility.
References and Resources for Additional Information:	King County Department of Natural Resources and Parks, Washington, *Surface Water Design Manual*, Appendix C, "*Small Site Drainage Requirements* 2009", C.2.5. "Rain Garden" , at http://your.kingcounty.gov/dnrp/library/water-and-land/stormwater/surface-water-design-manual/appendix-c.pdf

BMPs FOR EROSION CONTROL

King County
Site Management Plan (SiMPla)

May 2012

Department of Natural Resources and Parks
Water and Land Resources Division
Stormwater Services Section
King Street Center, KSC-NR-0600
201 South Jackson Street, Suite 600
Seattle, WA 98104
206-296-6519 TTY Relay: 711
www.kingcounty.gov/stormwater

Introduction
Erosion Control

It is important to keep stormwater as free as possible of sand and silt. By fully implementing erosion control measures like the ones included in this section, this goal will be achieved. The erosion control BMPs in this section should be implemented County-wide for these following work activities (and any other not included here but that have the potential to disturb site soils):

- Clearing land
- Grading land
- Earth excavation
- Construction activities that disturb soil
- Operating rubber-tired and tracked vehicles on unpaved surfaces

The BMPs in this section describe the necessity of performing various work tasks, as well as how to do the work so that stormwater flowing over and off County work areas is kept as clean and unpolluted as possible. By fully implementing the stormwater pollution preventing BMPs described in this section this goal will be achieved.

Specific erosion control BMPs are fully described in King County *Surface Water Design Manual, Appendix D, Erosion and Sediment Control Standards 2009.* Additionally, many King County facilities, as well as County, public and private construction sites, are required to have (and to fully implement) site specific Stormwater Pollution Prevention Plans. The BMPs described in this SiMPla section are not intended to lessen or remove any specific measures already required by either Appendix D or site-specific plans. Also, construction sites often are mandated to have CESCLs (Ecology-certified Construction Erosion and Sedimentation Control Leads) full-time on sites or to regularly inspect them, to ensure erosion and sedimentation requirements are being fully implemented.

If a staff worker or crew is unclear on how to perform either a work task or how to implement the stormwater pollution-preventing BMPs described here, staff needs to check with supervisors. If a supervisor is not clear on the best way to implement any BMP, he/she should contact King County Water and Land Resources Division (WLRD) Stormwater Services for clarification.

CLEARING LIMITS

Potential Pollutant Source: Sediment disturbed by site activities and mobilized by stormwater.

Purpose Clearing limits—in the form of fences—indicate areas to be worked (cleared and graded) versus areas to be left undisturbed (sensitive areas or other areas). The overall goal is to limit the amount of land cleared and graded in order to limit chances for site erosion and sediment being carried into the stormwater conveyance system and natural waterways.

Description of BMPs: Before any site clearing or grading, mark the edges of the following areas:

- Critical area buffers*;
- Significant tree areas; and
- Other parts of the site to be left undisturbed, as required by a permit, code or other project requirement.

The following methods can be used to mark clearing limits:

- High visibility plastic, metal or fabric fencing to prevent construction vehicles from entering areas to be undisturbed.

***Note:** For *critical area buffers*, plastic or metal fencing are *required*. Design and install per manufacturer instructions.

Phase I Permit Requirements BMP fulfills: S5.C.9.b.vii (2) Sediment and erosion control.

Search Words: Clearing limits.

King County *Surface Water Design Manual, Appendix D, Erosion and Sediment Control*

References and Resources for Additional Information:

Standards 2009, http://www.kingcounty.gov/environment/waterandland/stormwater/documents/surface-water-design-manual.aspx

King County *Stormwater Pollution Prevention Manual*, Activity Sheet A-27, "Clearing and Grading of Land for Small Construction Projects", http://your.kingcounty.gov/dnrp/library/water-and-land/stormwater/stormwater-pollution-prevention-manual/SPPM-Jan09.pdf

Regional Road Maintenance Technical Working Group (Western Washington/Puget Sound), *Regional Road Maintenance ESA Guidelines*, 2003, Part 2, Best Management Practices,. http://www.kingcounty.gov/transportation/kcdot/Roads/Environment/RegionalRoadMaintenanceESAGuidelines.aspx

Washington State Department of Ecology, Draft *Stormwater Management Manual in Western Washington*, Volume II, Construction Stormwater Pollution Prevention, 2011, at http://www.ecy.wa.gov/programs/wq/stormwater/wwstormwatermanual/2012draft/DRAFTVolume2Nov2011.pdf

COVER MEASURES

Potential Pollutant Source: Sediment disturbed by site activities and mobilized by stormwater.

Purpose Cover measures prevent soil from eroding from the faces of cut and fill slopes, stockpiles and other exposed/disturbed earth areas.

Description of BMPs: Cover measures include surface roughening, mulch, erosion control nets and blankets, plastic covering, seeding and sodding. Measures can be used alone or with other cover measures. More detailed descriptions of these BMPs are found in Appendix D of King County's Surface Water Design Manual. **Note: All erosion control measures need to be installed following manufacturers' instructions.**

Kinds of erosion control BMPs include:

Surface Roughening

Track Walking: Trackhoe or dozer tracks up and down slope to create horizontal tread marks in the soil. Typically done on slopes less than 2H:1V in steepness and over 5 feet high.

Mulch

Straw

Hydromulch

Compost

As soon as mulch is applied, it immediately protects disturbed soil from rain and wind erosion. Mulch helps seeds sprout and young plants grow by holding moisture, fertilizer, seed and topsoil, and also keeps soil from getting too hot or cold. Types of mulch include the following:

Straw: Should be 2”-3” thick; can be 1”-1.5” thick if used together with seed application.

Wood Straw: Should be 2”-3” thick; can be 1”-1.5” thick if used together with seed application.

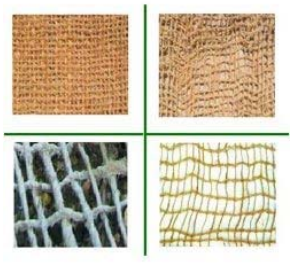
Wood Fiber Cellulose: Applied with hydromulcher machine and typically used with seed and tackifier (sticky chemical that helps hold mulch in place).

Bonded Fiber Matrix (BFM): Wood and/or paper fibers, held together by a chemical. When BFM dries after application, it protects against raindrop erosion but allows water to pass through to the soil below, to help seed and plant growth. Applied mechanically, like wood fiber cellulose.

Chipped Site Vegetation: Composed of chipped up debris from site clearing and grubbing (branches, bushes, etc.). Best used on slopes 10H:1V or less and also should not be used within 200 feet of surface waters, since it has a tendency to be moved by stormwater runoff.

Compost: King County requires compost be supplied by a supplier with a Solid Waste Handling Permit. Compost typically is applied 2”-3” thick; it can be tilled into final grades at landscaping time as a soil amendment. Note: compost is generally not recommended as a temporary cover measure on disturbed slopes, as rainfall easily mobilizes it in these situations.

Erosion Control Nets and Blankets



Erosion control net weaves

Erosion control blankets on a slope

Nets typically are loosely woven natural material, such as jute matting, or some kind of synthetic material. Blankets typically are non-woven, interlocking fibers such as excelsior (wood shavings) or straw. Coconut fiber (coir) is used for both nets and blankets. Nets and blankets hold seed and mulch in place on steep slopes. In some cases they’re used to reinforce turf to protect drainage ways during high stormwater flows.

Plastic Covering

Plastic soil stockpile cover

Plastic sheeting with a minimum thickness of 0.06 millimeters, and typically opaque (black). Used for immediate, short-term erosion control—protection from soil getting carried downslope and offsite by stormwater–on slopes, disturbed soil areas and soil stockpiles.

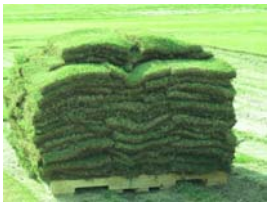
Seeding, Temporary and Permanent

Hydroseeding

Seeding reduces erosion by encouraging plant growth, which reduces erosion. Should be done on areas that have reached final grade, or that will remain unworked more than 30 days. Best time to seed is April through June, and September through mid-October. Seedbed should be firm but not overly compacted; steep slopes should be roughened; fertilizer may be used; and mulching is recommended (mulch should be monitored and corrective measures taken—including installing wattles or other stabilization techniques-- if rainfall is observed to mobilize it downslope).

Sodding

Sod rolls



Sod sections on pallet

Sod is turf (a soil layer with grass already established on it) that comes in rolls or as sections. Installing sod on disturbed soil areas quickly establishes a short-term or long-term soil cover to protect against erosion. Also, sodding can protect waterways from erosion (similar to the use of nets or blankets to protect them).

Wattles

Straw wattles as velocity reducers on slopes

Description: Wheat straw bound into tight tubular roll.
Application: When placed on slope faces they intercept stormwater runoff, reduce its velocity, spread the flow of rill and sheet runoff, and can capture and retain sediment.

Phase I Permit Requirements Fulfilled by BMP: S5.C.9.b.vii (2) Sediment and erosion control.

Search Words: Cover measures.

References and Resources for Additional Information:

King County *Surface Water Design Manual, Appendix D, Erosion and Sediment Control Standards 2009*, http://www.kingcounty.gov/environment/waterandland/stormwater/documents/surface-water-design-manual.aspx

Regional Road Maintenance Technical Working Group (Western Washington/Puget Sound), *Regional Road Maintenance ESA Guidelines*, 2003, Part 2, Best Management Practices,. http://www.kingcounty.gov/transportation/kcdot/Roads/Environment/RegionalRoadMaintenanceESAGuidelines.aspx

DEWATERING CONTROLS

Construction site pump

Potential Pollutant Source:

Excavation and other work tasks frequently require pumping of surface water, stormwater and/or groundwater that collects in these work sites. These waters can mobilize sediment disturbed by the work tasks. Excessive amounts of fine sediments in these waters, if discharged off-site in an uncontrolled manner, can harm streams and rivers.

Purpose

Prevents off-site discharge of untreated sediment-bearing water from excavations and other soil-disturbing activities.

Description of BMPs:

Foundation, vault, excavation and trench dewatering water shall be discharged into a controlled conveyance system prior to discharging to a sediment trap or sediment pond. Dewatering water shall be disposed of through one of the following, as site constraints allow:

- Infiltration to ground.
- Transported offsite by vehicle, for legal disposal.
- Discharged to sanitary sewer, with local sewer district approval.

Monitor pH of dewatering water that has come into contact with new concrete (tanks, vaults, foundations, etc.). Low pH (basic) water needs to be neutralized before discharging. High pH (acidic) water also needs to be neutralized; see BMPs C252 and C253 in Draft *Stormwater Management Manual in Western Washington* for details.

Clean, non-turbid water that has been removed from a site, such as well water, may be discharged via stable conveyance systems to surface waters, as long as the flow does not cause erosion or flooding of receiving waters.

Highly turbid or contaminated dewatering water shall be handled separately from stormwater. Vegetated spray fields may be used to infiltrate muddy water; see BMP C236 in *Draft Stormwater Management Manual in Western Washington* for details.

A gravel-filled sump (low depression filled with gravel which surrounds a

perforated pipe/bucket) should be used to help filter sediment out of pumped water.

A half round filter (one half section of perforated pipe cut lengthwise, with optional filter fabric lining, filled with wash rock) also can be used to filter sediment-laden water pumped from construction area. Cannot filter much fine sediment.

A kimble filter pipe (perf pipe added to an existing inlet pipe, surrounded by washed rock and wrapped with filter fabric) can also filter sediment from entering an existing pipe.

Use secondary containment measures while fueling and/or operating pumps, to prevent impacts from fuel spills.

Surface Water Collection.

Also Refer to SiMPla BMPs:

Phase I Permit Requirements Fulfilled by BMP: S5.C.9.b.vii (2) Sediment and erosion control.

Search Words: Dewatering controls.

References and Resources for Additional Information:

King County *Surface Water Design Manual, Appendix D, Erosion and Sediment Control Standards 2009*, http://www.kingcounty.gov/environment/waterandland/stormwater/documents/surface-water-design-manual.aspx

Regional Road Maintenance Technical Working Group (Western Washington/Puget Sound), *Regional Road Maintenance ESA Guidelines*, 2003, Part 2, Best Management Practices,. http://www.kingcounty.gov/transportation/kcdot/Roads/Environment/RegionalRoadMaintenanceESAGuidelines.aspx

Washington State Department of Ecology, Draft *Stormwater Management Manual in Western Washington, 2011,* BMP C236 for Vegetated Spray Fields, Section 4-111 at *http://www.ecy.wa.gov/programs/wq/stormwater/wwstormwatermanual/2012draft/DRAFTVolume2Nov2011.pdf*

Washington State Department of Ecology, Draft *Stormwater Management Manual in Western Washington, 2011,* BMP C252 for High pH Neutralization Using CO_2, Section 4-138 and BMP C253 for pH Control for high pH-water, both at *http://www.ecy.wa.gov/programs/wq/stormwater/wwstormwatermanual/2012draft/DRAFTVolume2Nov2011.pdf*

DUST CONTROLS

Potential Pollutant Source: Sediment disturbed by site activities and picked by wind can be carried into the stormwater conveyance system, adjacent properties and/or natural waterways.

Purpose Prevent wind transport of dust from exposed soil surfaces onto roadways, drainage ways, and surface waters.

Description of BMPs: Dust control measures can consist of chemical, structural or mechanical methods. Some dust control measures double as sedimentation control measures. There are four basic ways to limit dust emissions:

1. Don't create airborne dust.
2. Reduce wind speed at site ground level.
3. Bind dust particles together.
4. Capture and remove dust from its source.

The following are more specific BMPs:

- **End of day stabilization – End of each day on site: clean/sweep up paved areas; secure all soil stockpiles and other piles.**
- Limit cleared areas- Limits amount of ground exposed to wind.
- Physical barriers--Placed at right angles to prevailing wind currents at intervals about 15 times the barrier height (solid board fences, bales of hay, etc.)
- Site traffic control-Limit vehicle movement on site; use crushed rock/quarry spall entrances at all points of access. Wheel washes can also be used to limit tracking offsite.
- Earth moving plans—Earth moving phases should be completed shortly before they're needed; pre-water as needed; and reduce off-site hauling via balanced on-site cut-and-fill operations.
- Vegetative stabilization – Retain original vegetation as much as possible; retain native plants that are removed in land clearing and maintain them for planting at project completion; if removed plants

can't be replanted, chip them and use them as mulch; use rapid growing vegetation (grasses, groundcovers) for temporary protection; use sod for immediate stabilization; permanently stabilize site with locally sourced seeds, seedlings and plants.

- Watering sprays – effective, short-term measure. Use water trucks on large projects; sprinklers on any size project; hand-held hose on small projects.
- Soil compaction – may be useful to prevent dust being blown away; may increase stormwater runoff and erosion, however.
- **Project end site completion – At the completion of all site activities: clean/sweep up paved areas; permanently stabilize all disturbed soil areas; ensure effective and required drainage measures have been installed.**

Also Refer to SiMPla BMPs: Cover Measures; Traffic Area Stabilization; Clearing Limits.

Phase I Permit Requirements Fulfilled by BMP: S5.C.9.b.vii (2) Sediment and erosion control.

Search Words: Dust control.

References and Resources for Additional Information:

King County *Surface Water Design Manual, Appendix D, Erosion and Sediment Control Standards 2009*, http://www.kingcounty.gov/environment/waterandland/stormwater/documents/surface-water-design-manual.aspx

King County *Stormwater Pollution Prevention Manual*, Activity Sheet A-44, "Dust Control and Soil and Sediment Control for Manufacturing and Other Commercial Operations", http://your.kingcounty.gov/dnrp/library/water-and-land/stormwater/stormwater-pollution-prevention-manual/SPPM-Jan09.pdf

Regional Road Maintenance Technical Working Group (Western Washington/Puget Sound), *Regional Road Maintenance ESA Guidelines*, 2003, Part 2, Best Management Practices,. http://www.kingcounty.gov/transportation/kcdot/Roads/Environment/RegionalRoadMaintenanceESAGuidelines.aspx

Washington State Department of Ecology, Techniques for Dust Prevention and Suppression, Publication No. 96-433, March 2003, at http://www.ecy.wa.gov/biblio/96433.html

FILTERING/ PERIMETER PROTECTION & SEDIMENT RETENTION

Potential Pollutant Source:

Sediment initially disturbed by site activities, then mobilized and carried offsite by stormwater runoff. Excess sediment buildup in the stormwater conveyance system can prevent proper functioning by creating blockages in pipes, ditches and catch basins. Excessive sediment also harms natural waterways, including reproductive activities of salmon and other species

Purpose:

Site soils are often disturbed during construction, maintenance and other tasks performed on county properties, in the roads ROW and the stormwater conveyance system. Stormwater runoff can be kept clean by properly using filtering, perimeter protection and sediment retention measures.

Description of BMPs:

In General:

Filtering, perimeter protection and sediment retention measures are less-preferred approaches to erosion control than other measures, such as minimizing soil disturbance and stabilizing disturbed soils. It's best to not mobilize soil into the stormwater in the first place. However, it's prudent to use filtering, perimeter protection and/or sediment retention as safety measures, in case more-preferred erosion control measures are inadequate or can't be fully implemented. These methods are meant to reduce the sediment load in stormwater as the water passes through a filtering device and the sediment is captured.

Filtering, perimeter protection and sediment retention methods work if the flow rates are low, if devices can be readily inspected, and if devices are continuous where they need to be.

Perimeter protection measures are not intended for concentrated flows.

Install all perimeter protection measures prior to any upslope clearing, grading, or other soil disturbing activity.

Inspect perimeter protection daily to insure it's working. Maintain and/or repair as needed.

Remove perimeter protection at completion of activity and if appropriate to do so—some perimeter protection is biodegradable and may be left in place. Ensure all disturbed soil is stabilized--protected against being mobilized by stormwater.

Specific BMPs:

Here's a list of filtering/perimeter protection and sediment retention BMP techniques. These BMPs can be effectively used alone or in sets of two or more. **Note: Manufacturers' instructions need to be followed for effective use of these products for retaining or capturing soil.**

- Brush Barrier
- Coir Log
- Continuous Berm
- Curb Inlet Sediment Trap
- Excelsior Filled Log
- Filter Fabric (Silt Fence)
- Grass Lined Channel
- Gravel Filled Sump
- Half Round Filter
- Inlet Protection
- Kimble Filter Pipe
- Silt Fence
- Silt Mat
- ~~Straw Bale Barriers~~ (no longer allowed by King Co/Wa State)
- Straw Log
- Washed Rock

(See below for *brief* descriptions and applications for each of these. For fuller technical directions, please refer to specific project plans, *KC Roads ESA Guidelines* and/or Appendix D of the *KC Surface Water Design Manual*).

Filtering/Perimeter Protection Descriptions/Applications

Brush Barrier

Description: A long barrier of minimal width 5 feet consisting of woody debris with a maximum 6-inch diameter (small tree branches, root mats, stone or other debris left over from site clearing).

Application: Reduce stormwater runoff velocities and capture sediment.

Coir Logs

Coir logs stabilizing a stream bank

Description: Manufactured coconut fiber log.

Applications: Can intercept sheet flow and filter soil particles and debris. Can be used for temporary check dams in ditches; temporary stockpile protection; drop inlet protection; temporary interceptor dike and swale; and bank stabilization.

Continuous Berm

Continuous coir log berm stabilizing a pond bank

Description: Temporary diversion dike or sediment barrier built of soil, sand or gravel and encased within geosynthetic fabric.

Applications: Used for perimeter sediment control in diverting and/or intercepting sheet flow and retaining soil particles on site.

Curb Inlet Sediment Trap

Description: Temporary barrier of concrete blocks, gravel, filter fabric or gravel-filled bag.

Application: Filter out and help soil particles settle, rather than entering inlet.

Excelsior Filled Log

Excelsior filled log across a ditch

Description: Manufactured log filled with curled wood excelsior, or wood shavings.

Applications: Filtering water-borne soil particles in ditches, across culvert ends, or at the base of slopes.

Filter Fabric (Silt Fence)

Silt fence (staked, toed-in, vertical filter fabric)

Description: Synthetic, permeable fabric, woven or non-woven, usually in rolls.

Applications: Filtering water-borne soil particles at the base of slopes (when vertically installed, toed-in and staked as a silt fence). Also see Silt Fence.

Grass Lined Channel

Description: Vegetative lining of a ditch, water course, stream or swale.

Applications: Provides filtering of sediment from water, in water courses or as perimeter protection.

Gravel Filled Sump

Description: A low depression filled with gravel which surrounds a perforated pipe/bucket.

Application: Use to help filter sediment out of pumped water during dewatering.

Half Round Filter

Description: A one half section of perforated pipe cut lengthwise, with optional filter fabric lining, filled with wash rock.

Application: Used to filter sediment-laden water pumped from construction area during dewatering. Cannot filter much fine sediment.

Inlet Protection

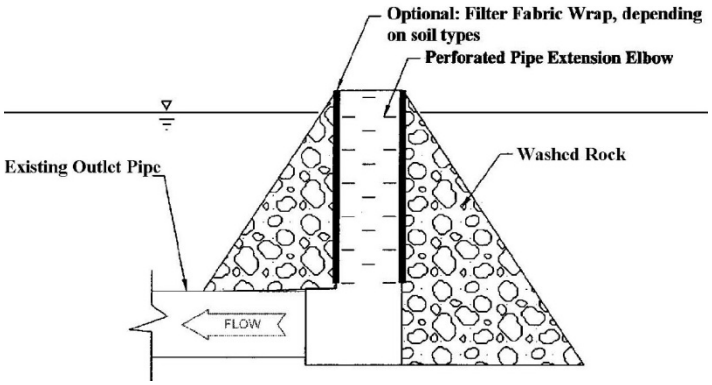
Filter fence box around a stormwater catch basin

Description: Filter located at the inlet to a stormwater conveyance: can be a filter fence box or a gravel berm outside an inlet; or silt sock or silt trap inside a catch basin or manhole.

Applications: Used in conjunction with other BMPs to prevent excessive sediment from entering stormwater conveyance system; sediment to be removed when

deposits meet one-half the height of the filter device.

Kimble Filter Pipe



Kimble filter detail, side view

Kimble filter description: A perforated pipe added to an existing inlet pipe, surrounded by washed rock and wrapped with filter fabric.

Application: Used to filter sediment from entering an existing pipe.

Silt Fence

Silt fence installed at perimeter of construction site

Description: Temporary sediment barrier—fabric stretched across and attached to supporting posts and entrenched into soil.

Applications: At areas of soil disturbance, used to filter sediment out of water and/or provide perimeter protection by intercepting sheet flow at the base of relatively flat slopes (additional silt fences need to be used parallel to one another for steeper slopes). Refer to Appendix D of *King County's Surface Water Design Manual* for further specifics.

Silt Mat

Description: Biodegradable, manufactured pad consisting of jute mesh, excelsior (wood shavings) and burlap, typically 4 by 10 feet in size.

Applications: Used at pump discharges, pipe outlets, in ditch lines and/or downstream of work sites to retain soil particles mobilized by water. Typically does not need to be removed at end of construction/repair activity.

Straw Bale Barriers

King County and Washington State Department of Ecology do *not* recommend or allow the use of straw bales for sedimentation traps or erosion control. Other erosion and sedimentation BMPs must be fully implemented.

Straw Log or Wattle

Description: Manufactured straw or flax logs (also called wattles), wrapped in plastic netting.

Applications: Filter sediment out of slope sheet flow and/or as perimeter protection.

Washed Rock

Description: Sediment-free, non-angular gravel.

Applications: Filter sediment out of water in steams, ditches or other. Should be used in conjunction with more effective erosion controls, including cover measures and effective traffic area stabilization, to keep sediment out of water in the first place.

Also Refer to SiMPla BMPs:	Dewatering Controls; Surface Water Collection.
Phase I Permit Requirements Fulfilled by BMP:	S5.C.9.b.vii (2), Sediment and erosion control.
Search Words:	Erosion control; sediment control; filter; filtering; perimeter protection; sediment retention.
References and Resources for Additional Information:	King County *Surface Water Design Manual, Appendix D, Erosion and Sediment Control Standards 2009*, http://www.kingcounty.gov/environment/waterandland/stormwater/documents/surface-water-design-manual.aspx King County *Stormwater Pollution Prevention Manual*, Activity Sheet A-27, "Clearing and Grading of Land for Small Construction Projects", http://your.kingcounty.gov/dnrp/library/water-and-land/stormwater/stormwater-pollution-prevention-manual/SPPM-Jan09.pdf Regional Road Maintenance Technical Working Group (Western Washington/Puget Sound), *Regional Road Maintenance ESA Guidelines*, 2003, Part 2, Best Management Practices,. http://www.kingcounty.gov/transportation/kcdot/Roads/Environment/RegionalRoadMaintenanceESAGuidelines.aspx Oregon Department of Environmental Quality, Erosion and Sediment Control Manual, Appendix F: Sediment Control BMPs, at http://www.deq.state.or.us/wq/stormwater/docs/escmanual/appxf.pdf

SURFACE WATER COLLECTION BMPå

Triangular silt dike with interceptor dike

Potential Pollutant Source:

Very fine soil particles (silt-sized) mobilized by stormwater runoff over disturbed soil areas and carried into the stormwater conveyance system and natural waterways. Excess silt harms fish reproduction and other natural processes.

Purpose

Numerous county tasks can contribute to soil disturbance. It's best to keep surface water and stormwater clean in the first place. However, due to the nature of some projects and site soils, even when other erosion control BMPs are in place, sometimes it's not possible to keep all silt out of stormwater. In such cases, sediment-bearing stormwater needs to be collected in ponds or tanks so it can stop flowing, to allow silt to settle out. In other cases, stormwater can be captured and conveyed (diverted) around disturbed soil areas, to both prevent erosion of the soil, and to keep sediment out of stormwater.

Description of BMPs:

The following is a list of surface water collection BMP techniques, to prevent stormwater from flowing over disturbed soil and causing erosion, and also to keep excessive sediment out of the stormwater. These BMPs can be effectively used alone or in sets of two or more. **Note: Manufacturers' instructions need to be followed for effective use of these products and materials.**

For Settling Sediment out of Stormwater:

- Construct *sediment ponds* per permit requirements and surface water design standards.
- Use portable siltation/sediment *tanks* when ponds cannot be constructed.
- Discharge water from ponds or tanks only when the water has met permit requirements.
- A nearby retention/detention pond may be used for discharging this water, if the water meets permit requirements and is clean enough to discharge.

For Diverting Stormwater:

- Interceptor Dike and Swale (Diversion Dam/Triangular Silt Dike/Diversion Channel)
- Pipe Slope Drains
- Subsurface Drains
- Ditches
- Outlet protection

(See below for *brief* descriptions and applications for each of these. For fuller technical directions, please refer to specific project plans, *KC Roads ESA Guidelines Part 2* and/or Appendix D of the *KC Surface Water Design Manual*).

Surface Water Collection Descriptions/Applications

Interceptor Dike and Swale (Diversion Dam/Triangular Silt Dike and Diversion Channel)

Description: An interceptor dike or diversion dam is a low berm or ridge of compacted soil. A triangular silt dike is a synthetic commercial product that mimics a dike or dam. A swale or diversion channel is a linear trench, often lined with grass, riprap, asphalt, concrete or other materials.

Application: Dikes, dams, swales and channels can be used at the top of slopes (and mid-slopes on large slopes) above disturbed soil areas to intercept and direct stormwater so that sheet flow runoff is slowed. Swales and channels can be used to convey runoff down sloping land to avoid erosion on slopes and to keep concentrated flows away from sensitive areas and bare soil. Exact specifications for all these features are site-dependent.

Pipe Slope Drains

Description: Pipes designed for specific sites.

Applications: Carry (divert) concentrated runoff in pipes down steep slopes without causing erosion or soil saturation of slide-prone soils.

Subsurface Drains

Description: Typically minimum 4 inch diameter perforated pipe.

Application: Capture and divert surface (and ground) water.

Ditches

Description: Temporary ditches related to soil disturbance (construction, etc.) Temporary pipes can also be used.

Applications: Capture and convey (divert) stormwater so that it doesn't flow over disturbed soil areas. Discharge to a non-erosive area.

Outlet Protection

Description: Typically a 6 by 8 feet rock pad of quarry spalls.

Application: Prevents soil from being scoured at the outlet of pipes.

Also Refer to SiMPla BMPs: Dewatering Controls.

Phase I Permit Requirements Fulfilled by BMP: S5.C.9.b.vii (2) Sediment and erosion control.

Search Words: Surface water collection; sediment ponds; sediment tanks.

References and Resources for Additional Information:

King County *Surface Water Design Manual, Appendix D, Erosion and Sediment Control Standards 2009*, http://www.kingcounty.gov/environment/waterandland/stormwater/documents/surface-water-design-manual.aspx

Regional Road Maintenance Technical Working Group (Western Washington/Puget Sound), *Regional Road Maintenance ESA Guidelines*, 2003, Part 2, Best Management Practices,. http://www.kingcounty.gov/transportation/kcdot/Roads/Environment/RegionalRoadMaintenanceESAGuidelines.aspx

TRAFFIC AREA STABILIZING BMPå

Potential Pollutant Source: Sediment tracked from disturbed soil traffic areas to public roadways.

Purpose Keep soil from being tracked offsite, to prevent excess sediment from entering the stormwater conveyance system and/or natural waterways.

Description of BMPs: Use these BMPs at construction sites where: dirt or mud can be tracked onto public roads; next to water bodies; when there are poor site soils (high amount of clays and silts); and/or when site is dusty during dry weather.

Design to fit site conditions.

Limit the points of entry/exit to the work area/construction site.

Limit vehicle speed for dust control.

Properly grade construction entrances/exits to prevent runoff from leaving construction site.

Route runoff from stabilized entries/exits through a sediment-trapping device before discharging it.

Design stabilized entry/exit for heaviest vehicles that will use it.

Phase I Permit Requirements Fulfilled by BMP: S5.C.9.b.vii (2) Sediment and erosion control.

Search Words: Traffic area stabilization.

References and Resources for Additional Information:

King County *Surface Water Design Manual, Appendix D, Erosion and Sediment Control Standards 2009*, http://www.kingcounty.gov/environment/waterandland/stormwater/documents/surface-water-design-manual.aspx

California Department of Transportation, *Construction Site Best Management Practices Manual*, March 1, 2003, "Stabilized Construction Entrance/Exit", at http://www.dot.ca.gov/hq/construc/stormwater/TC-1.pdf

BMPs FOR WATER CONSERVATION

King County
Site Management Plan (SiMPla)

May 2012

Department of Natural Resources and Parks
Water and Land Resources Division
Stormwater Services Section
King Street Center, KSC-NR-0600
201 South Jackson Street, Suite 600
Seattle, WA 98104
206-296-6519 TTY Relay: 711
www.kingcounty.gov/stormwater

Introduction
Water Conservation

Wash County vehicles as efficiently as possible, and only at commercial car washes or County facilities. When manually washing work vehicles at County car wash facilities, be sure to use nozzles to cut off water flow. Use the minimal amount of water needed.

Another way to keep water from carrying sand and silt off sites and into natural waterways is to use less or even zero irrigation water. By fully implementing irrigation water conservation measures like the ones included in this section, this goal can be achieved. The irrigation water conservation BMPs in this section should be implemented County-wide when performing these following work activities:

- Lawn and other area watering
- Watering annual plants, shrubs
- New hard surface installation (consider open pavers, gravel, etc.)
- Training employees in landscape maintenance
- Selecting landscape plants

If a staff worker or crew is unclear on how to perform either a work task or how to implement the irrigation water-conserving BMPs described here, staff needs to check with supervisors. If a supervisor is not clear on the best way to implement any BMP, he/she should contact King County Water and Land Resources Division (WLRD) Stormwater Services for clarification.

WATER CONSERVING METHODS

Potential Pollutant Source:

Sediment, nutrients and bacteria being carried off sites by excessive watering and entering the stormwater system.

Purpose:

Many King County owned and managed properties use irrigation for lawn and garden areas. Improperly maintained irrigation systems and overwatering can result in wasteful runoff into the stormwater system. Water conservation helps prevent this runoff. Fortunately, it also decreases the potential for pesticides, herbicides and fertilizers to be carried via irrigation water in the stormwater system into natural water bodies. "Smart watering" can reduce the need for pesticides in the first place, by preventing plant diseases that can be caused by over-watering. If there are animals on the properties (pets and livestock), less off site runoff can decrease the amount of fecal coliform bacteria (from animal waste) entering natural waters.

Description of BMPs:

Water grass lawn areas when there's a loss of shine or the lingering presence of footprints—these indicate dry soil.

If soil is dry or compacted, stop watering after a short while, wait a short while, and then restart watering. This prevents runoff.

Annual plants should be watered at the first sign of droop, about one inch a week.

Trees and shrubs usually don't need to be watered once they are fully established (two to four years old).

Water in the early morning to cut down on evaporation. This allows plant

leaves to dry out during the day, preventing fungal disease.

Adjust the watering schedule throughout the growing season. Plants typically need much more water in July and August than in September through June.

Other Techniques:

Direct building downspouts onto lawns and garden beds.

Adjust sprinkler heads to avoid "overspraying" (discharging directly to hard surfaces such as sidewalks, driveways and parking lots).

Use open pavers, gravel or other types of pavement that let rain soak into the ground.

Create swales to direct rooftop rain toward plants.

Related Training Needs:
Employees should be trained in the selection and care of landscaping plants that require lower amounts of water.

Train employees in irrigation system inspection, maintenance and repair.

Plant Selecting:
Select plants for water conservation. This means using as many wet winter/dry summer plants as possible. Some plant choices include the following Pacific Northwest native plants (for more plant choices refer to King County's Northwest Yard and Garden website at http://www.kingcounty.gov/environment/stewardship/nw-yard-and-garden/native-plant-resources-nw.aspx):

Trees
Betula utilis var. *jacquemontii* (Himalayan White Birch);
Liquidamber styraciflua (American Sweet Gum)

Shrubs
Berberis darwinii (Darwin's Barberry)
Gaultheria shallon (Salal)
Myrica californica (California Wax Myrtle)

Perennials, Grasses and More
Carex "Ice Dance" (Variegated Sedge)

Erythronium revolution (Pink Fawn Lily)
Hemerocallis cultivars (Daylily)

Pacific Northwest Native Plants include:

Trees
Acer circinatum (Vine Maple)
Quercus garryana (Garry Oak)
Tsuga mertensiana (Mountain Hemlock)

Shrubs
Arctosttaphylos uva-ursi (Kinnikinnick)
Mahonia nervosa (Cascade Oregon Grape)
Philadelphus lewisii (Mock Orange)

Symphoricarpos albus (Common Snowberry)

Perennials, Grasses and More
Asarum caudatum (Wild Ginger)
Blechnum spicant (Deer Fern)
Cornus canadensis (Bunchberry)
Smilacena racemosa (False Solomon's Seal)

Also Refer to SiMPla BMPs: *Integrated Pesticide Management* section; and Vegetation Management.

Phase I Permit Requirements Fulfilled by BMP: S5.C.8.b.ii (2), Water Conservation.

Search Words: Water conservation; watering; vegetation management.

References and Resources for Additional Information:

King County Northwest Yard and Garden website, Native Plant Resources, at http://www.kingcounty.gov/environment/stewardship/nw-yard-and-garden/native-plant-resources-nw.aspx

IPM Associates, Inc, Eugene, Oregon, "*Report on Integrated Roadside Vegetation Management*", prepared for King County, Washington, Department of Public Works, Roads and Engineering Division, Renton, WA, February 1994.

King County Department of Natural Resources, *King County Stormwater Pollution Prevention Manual*, January 2009, Activity Sheet A-23, "Landscaping Activities", and A-26, "Landscaping Activities and Vegetation Management" at http://your.kingcounty.gov/dnrp/library/water-

and-land/stormwater/stormwater-pollution-prevention-manual/SPPM-Jan09.pdf

King County Solid Waste Division, Natural Yard Care Program
http://your.kingcounty.gov/solidwaste/naturalyardcare/watering.asp

Saving Water Partnership, Seattle and Participating Local Water Utilities at
http://www.savingwater.org/outside_watering.htm

Seattle Public Utilities, "Choosing the Right Plants for a Beautiful, Trouble-Free Garden",
http://www.seattle.gov/util/groups/public/@spu/@csb/documents/webcontent/choosingt_200311261701525.pdf

Regional Road Maintenance Technical Working Group (Western Washington/Puget Sound), *Regional Road Maintenance ESA Guidelines*, 2003, Part 1, Regional Program Elements, Maintenance Category #15, Vegetation.
http://www.kingcounty.gov/transportation/kcdot/Roads/Environment/RegionalRoadMaintenanceESAGuidelines.aspx

Washington State Department of Ecology, *Stormwater Management Manual for Western Washington*, Vol. IV, Chapter 2, 2-23, "BMPs for Landscaping and Lawn/Vegetation Management".

King County
Integrated Pest Management Document

May 2012

King County

Department of Natural Resources and Parks
Water and Land Resources Division
Stormwater Services Section
King Street Center, KSC-NR-0600
201 South Jackson Street, Suite 600
Seattle, WA 98104
206-296-6519 TTY Relay: 711
www.kingcounty.gov/stormwater

SECTION I. PURPOSE

This document outlines King County's Integrated Pest Management (IPM) Guidelines. These contain general implementation steps as well as specific standards and IPM strategies. These guidelines offer general information about the IPM approach and specific practices appropriate to certain activities and land uses. These include: waterways, buffer zones, road rights-of-way, developed landscapes, lawns and turf, natural open spaces, and electrical facilities and also information about noxious weeds and pesticide handling. It is the intent of these guidelines to serve as the minimum standard for each King County Departments' IPM program.
These guidelines may be periodically revised based on new research and implementation experience. If revised, new editions of these guidelines will be distributed to participating departments and divisions.

SECTION II. IPM APPROACH

A. Definition of IPM

1. The following definition of IPM is based on Washington State law 17.15.010 RCW:*Integrated pest management is a coordinated decision-making and action process that uses the most appropriate pest control methods and strategies in an environmentally and economically sound manner to meet agency programmatic pest management objectives. The elements of integrated pest management include:*

    a) Preventing pest problems.

    b) Monitoring for the presence of pests and pest damage.

    c) Establishing the density of the pest population, that may be set at zero, that can be tolerated or correlated with a damage level sufficient to warrant treatment of the problem based on health, public safety, economic, or aesthetic thresholds.

    d) Treating pest problems to reduce populations below those levels established by damage thresholds using strategies that may include biological, cultural, mechanical, and chemical control methods and that must consider human health, ecological impact, feasibility, and cost-effectiveness.

    e) Evaluating the effects and efficacy of pest treatments.

2. The following lists the keys of an IPM approach to pest and vegetation management:

    a) Integrating IPM policies into the planning for and design of the soils, vegetation and landscaping of a facility or vegetated area, as well as into maintenance practices and specific pest control tactics.

    b) Using a preventive approach that emphasizes using field experience, research and training about managing vegetation ecosystem and their corresponding pests to proactively develop maintenance practices to promote appropriate and healthy vegetation growth.

    c) Placing an emphasis on knowledge about the pest and regular monitoring of pest levels as well as evaluation of control methods applied.

    d) Retaining native soil and using soil amendments such as compost, as a means to improve soil structure and provide organic matter, supply slow-release nutrients to plants, suppress soil-borne diseases and plant pathogens. In addition soil preservation helps to store moisture and reduce erosion while immobilizing and degrading some pollutants.

    e) Using “management” and “control” approaches in preference to elimination or eradication – except in cases of certain noxious weeds and specific situations where the tolerance threshold may be zero. In general, IPM establishes an approach to manage pest problems within tolerable limits.

The IPM approach encourages planning, design and maintenance of landscapes, rights-of-way and facilities that meet their intended purposes while promoting healthy plants (where appropriate) and minimizing pest problems. The IPM approach follows a process that begins with careful planning, design and construction decisions, followed by appropriate maintenance and management of public lands, facilities, and water bodies by employees with up-to-date training, while adhering to all legal requirements.

The IPM approach emphasizes a thorough knowledge of the pest or vegetation problem, pre-determined tolerance thresholds, regular monitoring to determine when those levels are met, and treatment of the pest or vegetation problem with appropriate tools. Tolerance thresholds are set at levels that keep pest numbers or vegetation problems low enough to prevent unacceptable damage, annoyance or public safety hazards while remaining economically and environmentally feasible.

IPM encompasses the use of chemical controls specifically in situations where they may be the most environmentally responsible or safest way to deal with a problem, or where other control tactics have proven ineffective at meeting tolerance levels. When chemical controls are necessary, decisions on their use will consider any possible effects on aquatic life (toxicity) and any tendencies for the chemical to move in the environment (mobility). Decisions on chemical use are made in conjunction with other control methods that are effective and practical.

B. Components of an IPM Approach

1. Planning and Design.

It is important to take into account efforts that will enhance intended uses of the land and minimize pest problems during the planning and design of a landscape, facility or road right-of-way. Design shall take into account such factors as types of uses, soils, grading and slope, water table, drainage, proximity to sensitive areas, selection of vegetation, and vector control issues.

2. Soil Structure

Soils play a critical role in the natural environment. Healthy soils keep disease-causing organisms in check, recycle and store nutrients, and provide an important medium for air and water to pass through. The properties of a healthy soil are similar to those of a sponge, faucet and filter. They naturally regulate the flow of water, bind and degrade pollutants. The presence of millions of macro and microorganisms in soil creates an environment where organic material is consumed and air and water are retained. Nutrients are made available to plants to allow healthy root growth and oxygen generation.

Soil disturbing human activities typically degrade soil's natural functions by reducing organic matter and pore space. Plant growth in these soils is hindered by lack of nutrients from organic matter thus requiring the use of chemical fertilizers and pesticides. With the loss of pore space the water holding capacity of soil is reduced and erosion and surface water runoff are greatly increased which negatively impacts waterways. Additionally, soil disturbing activities often create opportunities for the introduction of invasive weeds whether by directly introducing the

weeds or through creating degraded soils in which noxious weeds can propagate. Attention to soil as an IPM strategy minimizes the need for traditional pest management practices.

3. Maintenance and Landscape Health

Choices of vegetation as well as maintenance practices serve to keep areas as healthy as possible and thus minimize pest problems. Appropriate selection and retention of plants, irrigation, application of compost, mulch or fertilizer, mowing, and many other practices all serve to maintain healthy landscapes that withstand pest pressures and support natural predators for pests. A well-selected and maintained landscape reduces, often dramatically, the need for pest control.

4. Knowing the Pest

Identification of pests and knowledge of their life cycles are crucial to proper management. Potential pests should be documented and actual pests carefully identified in order to clearly focus IPM strategies. Field staff shall be trained in pest identification and allotted the time to conduct regular pest assessments. Additionally field staff should be encouraged to collect samples of unidentified species for later identification by a qualified expert.

5. Determining Tolerance Thresholds

Tolerance thresholds are levels of acceptable pest presence or activity that when exceeded will enact specific control actions. Tolerance thresholds must be established as part of a successful IPM program. They may vary by pest, specific location or type of land use. Weed threshold levels, for example, will be different for rural utility rights-of-way, urban ball fields, golf course greens and road shoulders. They will also differ depending on what class of noxious weed is present. Insect or plant disease tolerances will likewise be different depending on uses and/or specific locations.

The three distinct levels that may be identified as subsets of threshold determination are:

a) Injury thresholds, the level at which some injury begins to occur or is noticeable.

b) Action thresholds, the level at which action must be taken to prevent a pest population at a specific site from causing aesthetic, functional, or economic harm.

c) Damage thresholds, the level where unacceptable damage begins to occur.

In most environments certain levels of pest presence or injury can be accepted. IPM managers shall keep track of pests after the injury threshold is crossed so the pests do not get to the point where they can cause enough damage to impact the purpose of the landscape or facility being maintained. When the predetermined action threshold is crossed, interventions are implemented so as to avoid reaching the damage threshold. There are situations where the threshold level for pests may be set near or at zero. Laws and regulations set the population threshold level at zero for certain noxious weed species due to potential for economic injury, public health or environmental impact. Road shoulders immediately adjacent to the pavement are areas where weed tolerance is low due to public safety requirements and potential for significant economic losses should the paved roadway surface be compromised. Safety and

infrastructure protection also factor into the determination of very low or zero thresholds for weeds in areas such as electrical substations and propane tank storage yards.

6. Monitoring for Pests

Regular monitoring to assess pest level, extent, locations and stage in life cycle is an obvious but essential part of IPM. Monitoring provides an IPM manager with critical information about pest locations, type, and prevalence as well as effectiveness of control efforts current and historical. Analysis of gathered monitoring data against established tolerances is necessary to determine when action against a pest needs to be taken. Field staff will need training in pest identification and monitoring techniques, and management will need to allow time for appropriate monitoring to take place.

7. Developing the IPM Plan

The following elements should be considered when selecting appropriate strategies:

a) Preservation of natural systems and long-term health of the area.

b) Damage to the general environment.

c) Disruption of those natural controls which are present.

d) Hazards to human health.

e) Toxicity to aquatic life, including all aspects of salmonid life cycle and salmonid foods.

f) Mobility and persistence in the environment.

g) Impact to non-target organisms.

h) Timing relative to vulnerable periods in the pest's life cycle with the least impact on natural enemies.

i) Ability to produce long-term reduction in the pest.

j) Ability to be carried out effectively.

k) Cost effectiveness in short and long term.

l) Ability to be measured and evaluated.

8. Implementing the IPM Plan

Field staff play a crucial role in fully implementing the selected IPM strategies. However, management plays a more important role as field staff will be unable to implement IPM unless management provides that staff with the required resources. These resources will include specific training, equipment, time and a shared commitment to implementing IPM. Field staff will also need time allocated for appropriate monitoring and record keeping as IPM efforts are enacted.

9. Monitoring and Evaluation

With the implementation of an IPM program, staff shall begin an ongoing effort to record relevant details of the IPM program. By keeping comprehensive records of IPM information,

evaluation of the effectiveness of the IPM methods can be undertaken to assess how well IPM is working to bring about the desired pest reductions.

Evaluation of monitoring data can also help to clarify areas where staff may need additional training and promote discussion in the evaluation processes. While some IPM data requires detailed record keeping (such as pesticide usage), not all has to be elaborate or time-consuming and can be as simple as keeping a field notebook or logbook.

10. Learning and Revision

The results of the evaluation of the application of specific IPM strategies will provide insights into successes and failures of the IPM program as it is enacted. By reviewing these lessons IPM program managers can learn how to improve the IPM program to operate more effectively or efficiently.

C. Management Methods

Management methods to be incorporated in an IPM approach include:

1. Cultural

These are management activities that prevent pests from developing. This can be due to enhancement of desirable vegetation which is able to out-compete or otherwise resist the pests. Other efforts can be made to enhance the resistance of desirable vegetation such as, but not limited to irrigation, seeding, fertilizing, mulching, pruning and thinning.

2. Physical or Mechanical

Management activities performed using physical methods and/or mechanical equipment such as hand removal, baits, traps, barriers, mowers, brush-cutters, flame or hot water weeders, blades, hoes, string trimmers, or other physical means to control pests (including undesirable vegetation).

3. Biological

Management activities performed using insects, animals, birds, diseases or competing vegetation to control pests (including undesirable vegetation). Appropriate permits should be obtained from WSDA, USDA, EPA or applicable agency before release of any predator. Local noxious weed control boards should be notified of any biological control releases for noxious weed control. Research into the appropriate species for controlling the pest is needed in order for these efforts to be successful.

4. Chemical

Management activities performed using chemical agents registered as pesticides by the Washington State Department of Agriculture.

D. Record Keeping

1. Examples of records that may be maintained as part of an IPM program are:

a) The agency specific written IPM program kept in accessible location(s).

b) Site- or pest-specific IPM management plans.

c) Pest identification and assessment records of documented pests, including date, specific location, name, reference used for identification and/or corroborating expert (if appropriate), stage of life cycle, extent of pest presence and other pertinent information.

d) Maintenance methods performed to minimize pest populations and enhance healthy plant growth.

e) Control methods employed per the IPM strategy selected, including dates, location and other pertinent information.

f) Pesticide application records as required by the WSDA, including but not limited to licensed applicator's name, application target or site, chemical name, brand name, area of application, concentrations used, amount and rate of application, coverage rate, equipment used, weather conditions including temperature and wind, and date and time intervals of application.

g) Monitoring records documenting site or pest-specific observations that may include results of IPM methods used. Monitoring records are key tools for evaluating management strategies to allow assessment and revision as needed. Revisions should be documented. It should be emphasized that record keeping need not be burdensome. Simple field notebooks or logs can easily cover the majority of records kept, so that follow-up evaluation of what worked or didn't work and what to do differently in the future can be accomplished.

E. Training

The training of permanent and seasonal employees on the basics of the IPM policy, the IPM program and specific maintenance standards and IPM strategies will help ensure that they are understood and consistently followed. Implementing the IPM approach from design through daily maintenance will eliminate unnecessary applications of chemicals that could damage sensitive species including salmonid fishes or their habitat. In addition, full implementation of a well-understood IPM approach will help the County to reduce use of pesticides, save time and money and increase worker safety. Guidelines for developing a training plan are:

1. All staff associated with the planning, design, construction, and maintenance of parklands, roads, rights-of-way, park and ride lots, electrical substations, golf courses, other landscaped buildings and facilities and other areas where vegetation is managed and where pests may need to be controlled shall receive an orientation to the IPM policy, the department and/or division specific IPM program and these general guidelines.
2. Staff responsible for managing vegetation, including gardeners and laborers, shall receive training on:

a) An overview of IPM including identification and life cycles of typical Northwest pests, weeds, and beneficial insects; determining threshold levels for different types of landscapes; and monitoring techniques.

b) Noxious weed identification, control and regulations.

c) Pesticide laws and safety.

d) Working with organic amendments to reduce water, fertilizer and pesticide use.

e) How to apply specific IPM Best Management Practices as appropriate.

f) Who to contact for help identifying pests

3. Staff responsible for maintaining and scheduling irrigation system use shall receive training on:

    a) Irrigation system maintenance and repair.

    b) How to schedule irrigation based on vegetation physiology and habitat characteristics (evapotranspiration rates and seasonal fluctuations).

    c) Backflow prevention.

4. To the extent practicable, IPM training can be shared across agencies within King County.

SECTION III. SPECIFIC GUIDELINES

A. Waterways and Buffer Zones

King County recognizes the special sensitivity of Puget Sound and the freshwater rivers, streams, lakes, ponds, drainage systems and water quality facilities that fall under their stewardship. Pesticide use guidelines have been developed in an effort to minimize the potential for pesticides to enter waterways and impact these sensitive habitats, including threatened or endangered species.

This subsection establishes guidelines and limitations regarding maintenance methods and materials for use on or near waterways and the lands adjacent to them. It is the intent of these guidelines to complement the special management zones and buffer zones that were established as part of the King County ESA response. Management of existing, developed landscapes adjacent to water bodies is considered maintenance, not precluded by the ESA management and buffer zones. Pesticide use (or restrictions thereof) within ESA management and buffer zones should be consistent with the intent of the zones. Critical or sensitive areas ordinances of local jurisdictions should be consulted as well; the most restrictive rules or guidelines should be the ones followed.

1. Definitions

a) BIOSWALE is a vegetated drainage ditch or other open water course designed to filter runoff by the direct contact between surface water and the vegetation growing in the channel. A bioswale is an engineered drainage course, part of the surface water management system.

b) BUFFER ZONE is a corridor of land that is 25 feet in width on the sides of a stream or other body of water. Measurement of this buffer zone begins at the top of the stream bank. Anticipated seasonal or weather related changes affecting water level will be included in the decision making process when dealing with buffer zones. Measurement of the buffer zone in areas adjacent to tidal waters starts at the mean high tide line. Buffer zones may vary depending on the 4(d) rule, the outcome of council decisions, revisions to sensitive area and site alteration ordinances, etc.

c) WATERWAY refers to an open waterbody such as Puget Sound, a river, stream, lake or pond, and includes a biofilter, pollution reduction facility, roadside ditch or bioswale when water is present.

2. Record Keeping

Records will be kept of all pesticide applications as required by Washington state law (RCW 17.21.100 and WAC 16-228-1320). Additionally, when pesticide application occurs within a buffer zone, this will be clearly noted on the application record to facilitate tracking. The division IPM coordinator will conduct an annual review of pesticide applications to buffer zones and waterways to evaluate the potential for further reducing pesticide use in these areas.

3. General Guidelines for Buffer Zones

When pesticides are applied within a buffer zone, great care will be exercised. The following general guidelines apply to all pesticide applications in buffer zones:

a) Pesticide selection should consider persistence, mobility, and aquatic toxicity.

b) Pesticides selection will be carefully reviewed before application in buffer zones of waterways with known populations of federal- or state-listed threatened or endangered species during periods when early life stages are present. Pesticide use in these areas is allowed for the control of State/County listed noxious weed control.

c) Pesticides should not be applied when weather conditions increase the possibility of runoff or drift (e.g., when wind speed is > 8 mph).

d) Equipment, including nozzle size, pressure regulation, droplet size, and height of spray wand, should be selected to limit drift.

4. Specific Guidelines for Buffer Zones

Pesticide applications in buffer zones should be consistent with the following specific guidelines based on four classifications (A, B, C, D) that describe their current features, as well as define the differing objectives and maintenance rationales of their care. The matrix following the buffer zone classifications provides pesticides use guidelines for each classification depending on whether they are being used for routine maintenance, noxious weed control or for restoration and construction projects. Each department is encouraged to group individual landscapes or grounds within these Buffer Zone Classification categories.

Buffer Zone Classifications

A. Highly Managed Areas **Features:**	B. Intermediate Managed Areas **Features:**	C. Impacted Natural Areas **Features:**	D. Intact Natural Areas **Features:**
Ornamental landscape	Stream banks have some buffering with predominately native plants	Very limited impact to these areas	Very limited visitor impact
Public access and activity	Some impacts from use and park development apparent	Stream banks have buffering with predominately native plants	Native plant communities exist
High public use	Managed landscapes may be nearby	Limited impacts from use and park development apparent	No nearby developed park areas
May have mowed turf sometimes to edge of waterway	Stream bank erosion may be occurring due to use	Managed landscapes are not nearby	
May have facilities adjacent to water			
May have highly modified stream banks			
Often limited plantings in buffer			
Electrical substations			
Vegetation managed for safety and protection of assets			
Objectives:	**Objectives:**	**Objectives:**	**Objectives:**
Healthy plants and turf	Maintain healthy plant buffers	Maintain healthy plant buffers	Maintain healthy plant buffers
Maintain ability to handle high use	Minimize need for chemical intervention	Minimize need for chemical intervention	Low tolerance of invasive plants, non-natives
Minimize need for chemical intervention	Control invasive plants where feasible	Low tolerance of invasive plants	Maximize existing healthy ecosystem functions
Control invasive plants	Minimize impact on buffer	Minimize any impacts on buffer	Minimize any impacts from activities
Safe access	No bare soil areas	No bare soil areas	Control/eradicate noxious weeds
No bare soil areas except where required for protection of assets	Tolerance for natural appearance and weeds	Control/eradicate noxious weeds	
Low tolerance for weeds	Control/eradicate noxious weeds		
May have high expectation for aesthetics in general			
Control/eradicate noxious weeds			

Use of Herbicides within Buffer Zones of Waterways

Herbicide Use	Activity	D. Intact Natural Areas	C. Impacted Natural Areas	B. Intermediate Managed Areas	A. Highly Managed Areas
Pre-emergent herbicide use possible?	Routine Maintenance	No	No	No	Use only when weeds pose safety hazard.
	During Construction/ Restoration	No	No	No	Use only when weeds pose safety hazard.
Post-emergent herbicide use possible?	Routine Maintenance	Spot spray noxious and invasive weeds if necessary. Cut and treat stems of woody species.	Spot spray noxious and invasive weeds if necessary. Cut and treat stems of woody species.	Spot spray only. Cut and treat stems of woody species.	Spot spray only. Cut and treat stems of woody species.
	During Construction/ Restoration	Spot spray noxious and invasive weeds if necessary. Cut and treat stems of woody species.	Spot spray only. Cut and treat stems of woody species.	Spot spray. Broadcast spray for invasive species only. Cut and treat stems of woody species.	Spot spray and broadcast spray if necessary. Cut and treat stems of woody species.

5. Pesticide Use within Waterways

The use of pesticides in or on water shall comply with Washington State Department of Agriculture and Department of Ecology regulations. Each department and division should contact the local noxious weed program when managing noxious weeds in aquatic habitats (see Section III.F).

The following describes specific practices that may be used within the actual bodies of water. Pesticides should be carefully considered before being applied in waterways with known populations of federal-listed threatened or endangered species during periods when early life stages are present. This issue was recently addressed in a law suit (EPA Vs. Toxics Coalition) which determined that several pesticides needed additional testing to see if they impacted salmonids. If these pesticides were shown to have an impact, then buffers on pesticide application are legally required

a) Within Streams. In the rare need for control of noxious weeds or invasive weeds or non-native plants within a stream itself, mechanical and biological means will be utilized where feasible. When these methods are not feasible, emergent weeds may be controlled with a herbicide approved for aquatic use after obtaining appropriate permits from the Washington State Department of Ecology.

b) Within Pond and Lake Areas. Within a pond or lake, herbicides will be used only for the control of noxious or invasive weeds and non-natives that threaten the health of the habitat. When chemical methods are necessary within a pond or lake, only herbicides approved for aquatic application should be employed and only after obtaining appropriate permits from the Washington State Department of Ecology.

c) Within stormwater drainage treatment facilities. The facilities intercept stormwater run-off from land surfaces in order to improve the quality of the drainage discharge to natural waterways. For post emergent applications, the buffers of these facilities should be treated as class B streamside buffers.

d) Within Bioswales. If the bioswale has an outlet to surface water, its treatment will follow the same restrictions as a streamside buffer. If a bioswale does not discharge to surface water, the buffer is not covered under this waterways section of the policy; however, standard IPM guidelines apply.

6. Special Exception Areas

Special exceptions to these waterways and buffer zone guidelines address municipal golf courses:

a) Waterways and Buffer Zones at Municipal Golf Courses.

   i) The nature of the current layout of many golf courses places golf greens near to waterways in some limited instances. In the Tri County IPM Guidelines, these specific areas have buffers that are variable in width, and may be smaller than 25 feet. In limited areas, buffers may be reduced to as little as 10 feet due to proximity of golf greens to existing waterways. Special golf course buffer widths should never be less than 10 feet. Locations of these variances should be mapped and recorded. These variance areas are few in number and amount to a very small percentage of overall water.

   ii) In new construction or renovation and design of golf courses, placement of greens to allow establishment of standard width buffers is recommended. Incorporation of intercepting buffers is also encouraged where feasible. These intercepting buffers can be situated so that any possible runoff flowing towards open water is diverted into planted drainage systems and biofilters.

   iii) Routine Golf Buffer Maintenance Practices. There should be no application of broadleaf herbicides to turf in buffer areas.

b) Road Rights-of-Way

   Roadside vegetation management within King County varies from urban to rural settings. It is the intention of road and street maintenance divisions under this policy to approach vegetation management from an IPM standpoint that encourages protection of water quality and fish habitat. These specific road right-of-way guidelines apply generally to undeveloped roadways without curbs and sidewalks, and do not apply to such developed street areas as landscaped medians, islands and planter strips; the latter areas are covered under the developed landscapes guidelines in Section III.C. Roadside vegetation maintenance activities are subdivided into the four basic control or management methods that cover the scope of integrated pest and vegetation management. These four areas of control are cultural, physical/mechanical, biological, and chemical, as described in Section II.C. Specific actions within each area are considered BMPs for road right-of-ways.

All four of these integrated options, when used alone or in conjunction with each other, provide positive outcomes to essential functions of the roadway and the safety of the traveling public. Some of these benefits are as follows:

- Reduced icing
- Improved drainage
- Reduced fire hazard
- Promotion of non-motorized use
- Reduction in the spread, or eradication of noxious weeds and undesirable vegetation
- Limited erosion
- Increased bio-filtration
- Improved visibility of signs and structures
- Facilitation of the inspection and maintenance of other features and structures
- Improved visibility of shoulder for emergencies and obstacles
- Increased sight distance
- When used in conjunction with each other, lower herbicide use.

i) Cultural Control Methods:

- Hydroseeding products should not enter flowing water, wetlands, ponds, or lakes.
- Woody debris resulting from pruning or thinning should be removed from sensitive areas as required, except in the case of large woody debris specifically required to be left in a stream or other waterway as part of fish habitat enhancement plans.

ii) Physical/Mechanical Control Methods:

- Avoid cutting material on the backslope over running water.
- Pick up litter and woody debris from water, ditches, and slopes in sensitive areas.
- Recycle wood products when feasible.
- Mow grass and brush at heights that avoid “scalping” of soil.
- Knotweed will not be mowed unless top growth has already died or if it presents some type of safety hazard (line of sight problem to motorists, etc.) Mow knotweed at a height to avoid “scalping” of soil. Removed cuttings of invasive knotweed will be disposed of properly to prevent the spread of knotweed from fragments.
- Mow native vegetation at heights that promote its growth.

- Carry spill kit appropriate for equipment used.
- Amend soils with compost when appropriate.

iii) Biological Control Methods:

- Incorporate biological controls, such as use of beneficial predators, into road IPM practices wherever appropriate.
- Obtain appropriate permits.

iv) Chemical Control Methods:

- Use only as part of an integrated approach to pest and vegetation management.
- Follow all Washington State Department of Agriculture regulations pertaining to pesticide application (see Section III.H).
- Follow the Waterways guidelines in Section III.A when within 25 feet of any waterway.
- Use only State registered pesticides.
- Follow all label directions.
- Do not spray in windy or wet conditions.
- Do not spray within "Owner Will Maintain" areas.
- Do not spray within eroded areas where vegetation would be beneficial unless the vegetation are noxious weeds that are legally required to be controlled/eradicated.
- Replant, reseed in areas that are denuded of desirable vegetation.
- Carry spill kit appropriate for equipment and pesticide used.

c) "Owner Will Maintain" Program

When appropriate, participating departments and divisions should offer property owners the option of maintaining the right-of-way adjacent to their property in lieu of regular maintenance activities by King County. The "Owner Will Maintain" program typically applies to owners who wish to maintain their road-side properties to meet applicable standards without the use of herbicides. The "Owner Will Maintain" program should be advertised annually with adequate notice for property owners to participate in the program prior to application of herbicides or other pesticides by the public jurisdiction. Conditions of the agreement as it pertains to adequate control will be at the discretion of the local jurisdiction. Land owners participating in "Owner Will Maintain" program shall be contacted if the County Noxious Weed Control Program finds noxious weeds on their property.

B. Developed Landscapes

Many parks, public grounds, yards surrounding public buildings and other facilities, and groomed roadside medians, islands and planter strips along urban streets are developed

landscapes to varying degrees. These landscapes require careful design and maintenance in order to maximize their desired uses while minimizing pest problems. The following specific guidelines apply to these developed areas:

1. Planning and Design

A successful landscape requires comprehensive analysis and planning in a variety of areas when anticipating new site or redevelopment projects. Consider the following when planning or designing a landscape:

a) Evaluate physical site characteristics (e.g., soil characteristics, slope issues, and proximity to sensitive areas, etc.).

b) Consider how the site will be used and how it will affect neighboring properties.

c) Identify existing plants for retention or salvage, as appropriate.

d) Develop a program theme with stakeholders.

e) Identify maintenance impacts.

f) Debrief completed project with team.

g) Use native plants when practical.

h) Do not plant species that exhibit invasive characteristics.

2. Drainage

Healthy plants are easiest to maintain when site and soil conditions are suitable for the plants. Drainage patterns, slope, sun exposure, soil type, nutrients present, plant species present, and patterns of use all play a role in determining how plants will grow in a particular location. Most plants do not grow well in saturated soil. Plants need two types of drainage, surface and sub-surface. Planting areas need a surface shape that has no low spots where water can puddle and a slight slope so that some water from heavy rains can run off. Plants need a soil profile that is well drained, where water can percolate through to below the root-zone. Properly designed drainage systems can help provide the correct environment for growing healthy plants. The following are design guidelines to assist in a site drainage plan design:

a) Ensure the project manager and maintenance supervisors have provided adequate staffing and funding for ongoing maintenance of any drainage plan.

b) Minimize alteration of natural drainage patterns around existing vegetation that is to be preserved.

c) Conform to natural drainage patterns.

d) Provide opportunities for surface runoff of water to replenish the groundwater table.

e) Minimize soil erosion by dispersing water flow across the ground surface.

f) Reduce water velocity and increase soil permeability with plantings and organic amendments such as compost or mulch.

g) On steep slopes or areas that are prone to landslides, avoid using plants that require supplemental irrigation.

h) Implement erosion control devices as a form of preventative maintenance, e.g., application of compost or other organic soil amendments, slope protective material, protective berms, silt fences.

i) Avoid installation of permanent irrigation systems in landslide hazard areas.

3. Plant Selection

The successful landscape or grounds maintenance of an area is dependent on the initial plant selection in the design phase. Plant selection should be guided by four criteria:

a) Aesthetic and thematic schemes. Use of indigenous native plantings should be considered first, especially in large areas. The full range of horticultural species and cultivars may be appropriate for high use, high visibility landscapes.

b) Match environmental conditions of the site with the cultural requirements of the plant. It is essential that the cultural and environmental requirements of the plants be matched with the site conditions. Healthy landscapes are easiest to maintain when site and soil conditions are proper for growing the plants chosen. Drainage, slope, sun, soil texture and structure, nutrient levels in the soil, plant species and cultivars present, and patterns of use all play a role in determining how plants will grow in a particular location.

c) Maintenance impacts

   i) Pruning. To avoid routine pruning, select plant cultivars based on their size and shape when mature. When specific site issues override pruning concerns and when associated resource impacts are identified, plants requiring frequent pruning may be considered. Plants such as roses and sheared hedges may be appropriate for specialty gardens and selected focal points.

   ii) Weed management. Plant selection and placement should embrace IPM principles. Vigorous groundcovers, mulches, shade canopies and plant spacing are factors that can reduce the need for weed control. Noxious weed laws and quarantines should be followed. In existing plantings, IPM principles should be applied to weeds and other pests.

   iii) Plant pest management. In new plantings, use species and cultivars that are resistant to insect infestations and plant disease. Only in limited situations (e.g., replacement of ornamental historical plantings) should exceptions occur. It is important to follow IPM principles.

d) Environmental issues to be considered in plant selection include:

   i) Provide native wildlife habitat whenever possible, such as when adjacent landscapes currently provide habitat.

ii) Select plants with water needs appropriate to the site. Limit high-water-use plants to specialty plantings or where the natural water table will support the plants without supplemental irrigation. Group plants with similar water needs together.

iii) Avoid plants that will require significant pest management. Select native plants or disease resistant cultivars and avoid insect-prone species.

iv) Avoid plant species with invasive growth or seeding habits. See Section III.F for more guidelines on noxious weeds.

v) Prevent surface soil erosion by covering soil with plants or mulch.

vi) Select plants with similar horticultural needs for groupings.

vii) Avoid the use of commercial wildflower seed mixes. These tend to contain weed seeds and introduce exotic invasive plants and noxious weeds. If a seed mix is used, use only weed-free mixes from reputable local sources.

4. Plant Health

Healthy plants are better at reducing pest infestations and out-competing weeds, and they need less water. The following are guidelines for environmentally responsible maintenance of plant health:

a) Plant in the fall, when feasible, to take advantage of fall and winter rains and to reduce the need for supplemental irrigation.

b) Prior to planting, assess and monitor soil conditions. Soil tests are the most effective method of determining soil conditions. Monitor regularly and modify practices accordingly. If necessary, amend the soil appropriately; include organic material such as compost.

c) When replanting beds or turf areas, mature compost (about 20 percent by volume) should be incorporated to a depth of 8 to 12 inches or, preferably, the full rooting depth of the plants to be installed.

d) Base fertilizer applications on soil test and plant requirements. Fertilizer sources should be chosen to minimize leaching and toxicity. Natural organic and synthetic slow-release fertilizers should be considered before soluble fertilizer sources. Avoid applying phosphorus unless a soil test indicates that it is necessary.

e) Avoid over-watering plants to conserve water, improve plant health and minimize leaching into surface and ground water. Over-watering is a primary cause of plant disease and demise.

f) Determine the seasonal evapotranspiration (ET) rate for the site and use it to estimate the amount of irrigation water needed to replace that lost as ET. During Puget Sound summers the average ET is about one inch of water per week (somewhat less than one inch in May, June, and September, and somewhat more than one inch in July and August).

g) Use weed-free compost, gravel, and mulch materials.

h) If a site has large established populations of invasive plants, remove the invasive plants prior to establishing new plantings.

5. Mulch

Using organic material as a soil topping improves soil conditions by:

a) Reducing evaporation.

b) Improving water infiltration.

c) Reducing run-off and erosion.

d) Enriching soil fertility and texture.

e) Immobilizing or degrading pollutants.

f) Inhibiting the growth of competing, nutrient-absorbing weeds.

The following are guidelines for using mulch in plantings:

a) Do not apply mulches where they may migrate or leach nutrients or tannins into waterways.

b) Maintaining a 2-inch minimum layer of mulch in planted areas is recommended.

c) A mulch-less zone around the base of tree trunks is recommended to discourage root-rotting fungi.

d) Wood chips should be used whenever appropriate. On-site chipping simplifies the maintenance process by providing chips that are effective, free, readily available, and have a natural look. In addition, using wood chips generated on-site for mulch reduces the need to haul green-wastes, thereby saving energy. It should be noted that, where wood chips are used for mulch, nitrogen might need to be added (5 pounds/1000 square feet).

e) Other acceptable materials include compost, shredded bark, Steerco, Groco, or Nutra Mulch.

f) When purchasing mulch materials, specify that they should be “weed- and disease-free.”

g) Unless disease problems are present, allow leaf litter to accumulate upon the soil within planted areas that are not intended to have a manicured appearance.

h) Prevent weed infestations by covering mulch, soil, and compost piles with plastic tarps, as needed.

6. Automatic Irrigation Systems

Efficient use of irrigation water conserves water and reduces runoff. Irrigation of landscapes is one of the most publicly visible landscaping activities, reinforcing the need for effective water management by public entities. Agencies should seek the advice of their local water purveyor for conservation planning. The following guidelines will assist in conserving water for landscape maintenance:

a) Identify site irrigation needs based on use, plant needs, soil permeability, and topography.

b) Use water efficiently.

   i) To achieve maximum efficiency, perform system maintenance and repairs.

   ii) Check and repair all problems at system turn-on in the spring.

   iii) Inspect backflow preventors annually, consistent with state law.

   iv) Conduct a complete system audit during design and when major changes occur to the system.

   v) Once an effective schedule is established, it should be monitored bi-weekly to avoid "brown outs."

   vi) Avoid irrigating in the heat of the day.

c) Conserve water.

   i) Reclaimed water is desirable where it is available to promote the conservation of limited potable water

   ii) Cut back on irrigation as weather indicates. Use historic evapotranspiration data for your area.

   iii) Reduce irrigation incrementally in late summer.

   iv) Many planting areas can be irrigated less as the plants mature and become established. Plantings designed with native or drought tolerant species should gradually be weaned from all irrigation on a 3 to 5 year schedule.

d) Create a permanent irrigation record system that documents where, when and how much water was used to "fine tune" a system, rather than recreate it each year.

C. Lawns and Turf

Lawns and turf areas are an important subset of developed landscapes that demand specific attention regarding IPM implementation. Lawns are used for a variety of purposes. Lawn maintenance can significantly affect the environment in a negative way if not carried out with attention to proper environmental practices. The intended use of a lawn or turf area will determine many of the maintenance specifics. Healthy lawns can resist disease, pests and drought damage and can out-compete most weeds without reliance on chemicals. Properly maintained lawns also require less supplemental irrigation. Some lawns are non-irrigated or minimally irrigated and brown out in the summer. Where it is possible, irrigate deeply once each summer month; this will help keep the crowns of the desired grasses alive. Continue mowing throughout the summer months to reduce the quantity of weed seeds produced. Turf that is heavily used should be irrigated, if possible, to avoid serious degradation. Improving cultural practices such as fertilizing, over-seeding, and aerating can make a lawn more drought resistant. The following guidelines will assist in maintaining lawns and turf areas in an environmentally responsible manner:

1. Assess Turf Condition.

Assess the condition of the lawn or turf. Look for turf density, turf species present, percent weed cover, and color. Healthy lawns in the Puget Sound region are a medium green color.

2. Determine Maintenance Effectiveness.

Review the maintenance schedule to assess effectiveness. Consider whether acceptable results can be achieved at lower maintenance levels or significant improvements can be realized through minor program adjustments. The following areas should be addressed:

a) Soil testing and results.

b) Mowing and edging.

c) Irrigating.

d) Fertilizing.

e) Hand weeding.

f) Pesticide application.

g) Aerating.

h) De-thatching.

i) Overseeding.

j) Drainage.

3. Develop Maintenance Standards and Thresholds

Develop maintenance standards and threshold levels for categories of use and types of turf. For example, low use, low visibility turf areas have higher weed and pest thresholds than heavily used and high visibility lawns do. Develop maintenance schedules that reflect the assessment for each of the elements of 2 above. Use the following maintenance practices for high use turf areas:

a) In general, mow high, mow often, and leave the clippings. Mow at correct mowing height for the grass species in the turf. Mow at least weekly in spring.

b) Fertilize lightly in the early fall and late spring with a natural organic or slow-release fertilizer.

c) Water deeply to moisten the root zone, but water infrequently. Lawns newly planted in spring, however, need frequent watering.

d) Periodically top dress with an organic amendment such as compost.

e) Avoid using quick-release fertilizers.

f) Do not use weed and feed products.

g) Evaluate the need for, and impacts of use before applying pesticides. Ensure that all regulations related to pesticide application are followed if use is approved.

h) Follow buffer recommendations contained in the Waterways section (3.A) where lawns abut streams, lakes or other waterways.

i) Annually aerate lawns in the spring or fall to improve root development; high-use turf should ideally be aerated two to three times a year.

j) Consider purchasing electric mulching mowers, when new machines are needed.

D. Natural/Open Spaces

1. Natural or open space lands should be managed under the following general guidelines:

a) Conserve wildlife habitat and foster native species. This may include restoring degraded natural areas to increase their habitat and educational values.

b) Maintain, enhance, and restore vegetation for its ecological and wildlife habitat value and visual benefits.

c) Emphasize the use of drought tolerant plants and native vegetation in site development and restoration to minimize the need for irrigation and reduce damage caused by non-native species.

d) Use proper plant selection with regard to natural site moisture conditions.

e) Work with other agencies to maintain the necessary quality and quantity of water in streams and lakes to provide for plant communities, suitable fish and wildlife habitat and recreational use.

f) Develop and apply environmentally sensitive maintenance techniques and BMPs as responsible stewards and caretakers of the system.

E. Noxious Weeds

Noxious weeds, as defined by Chapter 17.10 RCW, are non-native plants that are highly destructive, competitive or difficult to control. They have been introduced accidentally or as ornamentals, can impact or destroy native plant and animal habitat, reduce crop yields, poison humans and livestock, clog waterways, reduce recreational opportunities and lower land values. A state noxious weed list is adopted annually in WAC Chapter 16-750. State law requires both private and public landowners to eradicate certain plants, prevent seed production and prevent the spread of state listed noxious weeds. Failure to comply with the state weed control law can result in an enforcement action or civil infraction.

1. Noxious Weed Classes

The three classes of noxious weeds are:

a) Class A weeds have a limited distribution in Washington. Control and eventual eradication of these species is required in all of Washington State.

b) Class B weeds are currently limited to portions of Washington. Class B weed lists will differ from county to county based on the weeds' distribution and each county weed board's policy. Control of certain Class B weeds may be required.

c) Class C weeds are common throughout Washington. Counties can select priority weeds off the Class C list for mandatory control. Contact your county weed board for a full noxious weed list for your county. The state noxious weed list is updated annually. The County Weed Control Boards also adopt a weed list annually. The King County Noxious Weed List is available on the web (www.kingcounty.gov/weeds). Contact the King County noxious weed control program for educational and technical assistance on identifying, controlling, and preventing noxious weed infestations at 206-296-0290.

2. Noxious Weeds and IPM

A few of the IPM techniques to follow when dealing with noxious weeds are:

a) Prevent noxious weed problems; learn how to identify noxious weeds, learn strategies for controlling or eliminating them.

b) Monitor for the presence of noxious weeds and weed damage.

c) Treat noxious weed problems to reduce populations using strategies that may include biological, cultural, mechanical, and chemical control methods – always consider human health, ecological impact, feasibility, and cost-effectiveness.

d) Minimize the use of chemical pesticides by using alternative control methods when appropriate and by using chemical controls correctly.

e) Evaluate the effects and efficacy of noxious weed control treatments. The methods of control include pulling, repeated mowing (effective in controlling only certain species), digging to eliminate all roots and rhizomes, cutting and bagging to remove seeds, use of landscape fabric, replanting with appropriate species, and in some cases herbicide applications. It is usually necessary to constantly check the site for newly emerging seedlings and plants missed in previous control efforts.

3. Additional Guidelines

Additional guidelines regarding noxious weeds include:

a) Learn to recognize and eliminate noxious and invasive weeds before they establish.

b) Choose non-invasive species for landscapes and gardens.

c) Prevent noxious weed infestations by checking vehicles, clothing and equipment for weeds and seeds.

d) Remove or control weeds safely and appropriately. The most important step is to control seed production by cutting down and bagging noxious plants.

e) Protect yourself when working with noxious weeds; some, such as hogweed and leafy spurge, contain toxins that can damage skin on contact.

f) Replant with appropriate species to prevent weeds from returning.

g) Dispose of noxious weeds and weed seeds properly. Consult with the County program (contacts above) for specific recommendations. Do not compost any noxious weed debris that may contain seeds or plant parts that might take root.

h) In cases where noxious weeds may impact habitat (aquatic or terrestrial), control measures may need to be taken to restore the habitat functions.

i) Clean equipment, shoes, and clothing before moving off of work site if the site is contaminated with noxious/invasive species.

4. Common Noxious Weeds

Some of the common noxious weeds found in this region are:

a) Giant hogweed – predominantly an urban weed and an escaped garden ornamental, its sap can cause skin blistering and scarring. Washington State law requires that giant hogweed be eradicated.

b) Tansy ragwort – likely to infest pastures and roadsides, it has toxins that can be fatal to cows and horses and can be found in milk and honey.

c) Spotted and diffuse knapweeds – threaten wildlife habitat, pastures, and grasslands by displacing beneficial species.

d) Purple loosestrife – grows in wetlands and along lakes, rivers and streams; it chokes out wildlife habitat and clogs drainage ditches and irrigation canals. Purple loosestrife now invades wetlands in numerous states at an estimated cost of $45 million a year for control and loss of forage crops, crowding out native plants and endangering the wildlife that depend on the native plants.

F. Electrical Facilities

1. Substation Gravels

Electrical substations, switchyards, and other installations housing electrical equipment typically have a 6-12” gravel surface as an insulating barrier above a subsurface electrical grounding mat. The gravel protects workers from voltage differences and high electrical currents that can occur during electrical fault episodes. Weeds growing in electrical substation gravel compromise the gravel’s ability to insulate workers from the ground mat, which increases the risk of electrical hazards. The following guidelines will assist in maintaining electrical substations in an environmentally responsible manner that is protective of worker safety:

a) Utility electrical engineers should evaluate the potential electrical effect of vegetation inside substations depending on the type of substation or electrical installation. Develop maintenance standards which define the level of weed management necessary

for safety. For example, receiving substations, cable terminuses and switchyards which pose the greatest electrical hazards may have a zero tolerance for vegetation and need to be maintained weed-free. Other installations which pose lesser risk, such as 4 kV stations and enclosed industrial transformers, may require less rigorous weed control, e.g., to avoid trip hazards or impeding work inside a confined area.

b) Use IPM strategies to control weed growth over the short-term, including:
    i) Burning weeds with flame or steam.
    ii) Mechanical removal.
    iii) Elective use of pre- and post-emergent herbicides.

c) When feasible, use long-term solutions such as:
    i) Replacing gravel more frequently.
    ii) Designing new substations, or renovating existing installations, with electrical ground mat/insulating systems which prevent weed growth or preclude need for rigorous weed control.

2. Electrical Transmission Rights-of-Way

As a matter of public safety and system reliability, electric utility rights-of-way (ROW) have a continuing need to preclude the establishment and subsequent growth of vegetation into and close to overhead electric lines. The situations on the electric utility rights-of-way that necessitate vegetation management are:

a) Tall-growing trees below the overhead electric lines that will grow upwards into the conductors (electric lines).

b) Tall-growing “danger trees” encroaching from the ROW’s edge that may fall into the conductors.

c) Vegetation blocking access to the transmission system.

d) Noxious weeds.

e) Aesthetic improvement of ROWs.

The following guidelines utilize an IPM approach to ROW maintenance which provides a safe and environmentally sound program:

a) Emphasize proper selection and placement of trees on the ROW.

b) Improve streamside management techniques (erosion control, riparian habitat enhancement, improve fish passage).

c) Encourage low-growing native species.

d) Use beneficial insects to control noxious weeds.

e) Use manual or mechanical vegetation removal methods.

f) Selectively use herbicide for cut stump treatment, applied only to tall growing tree species to reduce resurgent tree growth problem.

g) When pesticide is needed, select the proper pesticide best suited to control that pest.

G. Pesticide Handling

When a decision is made to use a pesticide as part of a specific IPM strategy, precautions should be followed for storage, mixing, loading, application, cleaning and disposal, to ensure public health and safety as well as environmental protection.

1. Storage Areas

Storage areas should be carefully surveyed. Spills are very likely where containers are handled. Good storage practices include:

a) Provide secondary containment. Store pesticides in an area that will keep any spilled material in a bermed or enclosed area with a concrete floor and no drain until clean-up can occur. High-sided plastic containers offer at least interim protection, depending on the product being stored.

b) Store pesticides in their original containers.

c) Keep pesticides out of the reach of children, pets, and livestock.

d) Store liquids on the bottom shelf.

e) Do not store bagged material below liquids.

f) Separate insecticides, herbicides, etc.

g) Inspect containers periodically for leaks and spills.

h) Determine whether stored products can withstand freezing and store appropriately.

i) Rotate stock; use the oldest first.

j) Provide adequate ventilation.

k) Store Personal Protective Equipment in a separate location.

l) Keep labels and MSDSs current and available on site.

2. Mixing and Loading

Pesticides can be spilled during mixing and loading. If spilled on the ground, they can eventually contaminate groundwater. If spilled on a paved area, they can eventually wash into floor or storm drains. This should be avoided.

a) Read the label thoroughly before mixing and follow all directions carefully. Handle pesticide concentrates carefully to avoid accidental spills and personal harm.

b) Because the applicator is handling concentrated product, this is the most dangerous phase of pesticide use. Be sure to wear all Personal Protective Equipment (PPE) required by the label.

c) Measure accurately. It is illegal to mix pesticides at rates higher than those listed on the label.

d) Calculate the area to be treated and the amount of material needed carefully. Calibrate equipment accurately. Mix only the amount needed.

e) Avoid contaminating water supplies by avoiding back-siphoning while adding water to tanks.

f) Triple rinse containers immediately upon emptying. Pour rinsate into application tank to use in subsequent treatments. Make sure containers are appropriately marked or labeled.

3. Application

When mixing and applying pesticides, all label precautions must be followed. It is a violation of federal and state laws to disregard label directions.

a) Spot treat only the area or pest where the problem occurs, following the selected IPM strategy. Avoid broadcast application.

b) Follow label directions for PPE and for weather and other conditions appropriate for treatment. Do not spray or otherwise treat if it is too windy (> 8-10 mph) or too wet. The pesticide should reach only the intended target.

c) If pesticide is spilled on skin or clothing, remove clothing and wash skin thoroughly.

d) Leave no-spray buffer strips near surface waters. See Section III.A for specific guidelines.

e) Be prepared for spills. Have clean-up materials available for immediate use.

f) Keep people and animals off of sprayed areas as noted in the label directions.

g) Post appropriate signage at applied areas, following WSDA regulations.

4. Cleaning

Cleaning of pesticide application tools presents another significant opportunity for spills or other contamination incidents. Caution should be exercised.

a) Clean equipment after each use unless it will be used for the same chemical the next time.

b) Rinse equipment thoroughly; triple rinsing is the standard. Rinsate should be saved for use in the next application. If rinsate is used in further applications, it must be applied according to label directions and the selected IPM strategy.

5. Disposal

Containers, equipment and unused, surplus, or waste pesticide product must be disposed of in ways protective of public safety and the environment.

a) Properly dispose of empty containers. Triple-rinsed plastic containers should be recycled through the Plastic Pesticide Container Collection Program run by Washington

Pest Consultants Association 509-457-3850. Thoroughly emptied bags and triple-rinsed liquid containers that cannot be recycled can usually be disposed of at a solid waste facility; follow label directions and advice of the King County solid waste characterization program 206-296-4633.

b) Rotate stock of chemicals so the oldest is used first; thus reducing the need to dispose of outdated chemicals.

c) Some pesticides are ineffective if stored at freezing temperatures; read the labels and store appropriately to avoid having to dispose of frozen products.

d) Surplus pesticide which is still usable and which would meet the conditions for use in the King County IPM program (i.e., not banned or restricted, and not surplused because it is found to be too hazardous, toxic, mobile or other detrimental reason) may be referred to the Industrial Materials Exchange ("IMEX") at 206-296-4899 to find an appropriate user.

e) Unusable, waste pesticide must be disposed of legally, usually as a hazardous waste. Follow all applicable laws and regulations, using a licensed hauler and permitted treatment, storage and disposal facility if required. The Washington State Department of Agriculture offers a Pesticide Waste Disposal Program where unusable pesticides might be able to be disposed of at no cost. Regional events are held around the state as funding allows. There is no charge to participate in these disposal events. Contact WSDA at 360- 902-2056 for more information or to preregister for an event.